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THE ORATOR'S TRAINING IN ANCIENT GREECE.

PHOTOGRAVURE AFTER THE PAINTING,
"DEMOSTHENES EDUCATING HIS VOICE,"
BY JULES JEAN LECOMPTE-DU-NOUY.

IT is said that Demosthenes was educated in the school of Isæus. It has never been proven that he did not actually practise elocution by the seashore with pebbles in his mouth. Those who delight in negative criticism have challenged the story, but they will never rob it of its charm for the painter and the lover of the picturesque.

Text Matter

INTERNATIONAL UNIVERSITY Reading Course



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SPECIAL INTRODUCTIONS BY
RT. HON. AUGUSTINE BIRRELL, K.C.
SIR GILBERT PARKER, K.T., D.C.L.

International University Society

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ACKNOWLEDGMENTS

W^E welcome this opportunity to write some lines of acknowledgment, for it allows us to express thanks—inadequate it is true—to those whose help, so generously afforded, greatly enhances the value of this work. The labour of writing and collating necessary for a Course on such a generous scale as this was very great, therefore we are precluded from publication of a full detailed list of names of all those to whom we are indebted for assistance or advice ; but we cannot omit mention of some specialists and authorities of world-wide fame, whose contributions set a hall-mark upon the complete work.

The names and writings of such men as Lords Rosebery, Bryce, Oxford and Asquith, and Balfour ; Dr. E. Barker ; Mrs. Besant—in relation to mental culture—coupled with the distinguished work of Professors B. Keith, Dendy, and Laird ; are known wherever the English language is spoken as high authorities on their respective subjects, and though perfection is the goal of a journey which never ends, we may claim, thanks to these distinguished co-workers, to have advanced some furlongs on the way.

The work will be found to embrace a variety of subjects, and this calls for the presentation of material contributed by men of French, Italian, Spanish, Greek, and many other nationalities. These contributions required translation, and where possible the versions used are generally taken from authorities already accepted as standard and scholarly ; it being part of the working plan that tested translations should be used as a means of obtaining a close rendering of the spirit of the foreign authors ; a necessary quality not always found in special translations where the beauty of the original is sometimes lost.

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SOME HINTS ON READING

By LORD BRYCE.

IT has often been said that books do for us to-day what universities did in earlier ages. The knowledge that could five centuries ago have been obtained only from the lips of a teacher, can now be gathered from the printed page. Nevertheless, since it is only the most active and most diligent and most discerning minds that can dispense with the help and guidance of teachers to show them what to read and how to read, universities and colleges are scarcely less useful if not quite so indispensable to-day as they were before the invention of printing. It is, therefore, not unfitting that in your college I should be asked to talk to you about books, the way to choose them, and the way to draw most profit from them. The very abundance of books in our days—a stupefying and terrifying abundance—has made it more important to know how to choose promptly and judiciously among them if one is not to spend as much time in the mere choice as in the use. Here you have the help of your professors. But here you are only beginning the process of education which will go on during the rest of your life. By far the largest part of your process will, after you have left college, consist in your independent reading, so the sooner you form habits of choice and methods of use, the better.

The first piece of advice I will venture to give you is this : Read only the best books. There are plenty of them, far more than you will ever find time to read, and when they are to be had it is a pity to waste time on any others.

You may ask what I mean by the Best books. Passing by for the moment those which in each of the great world-languages we call its classics, I mean by the Best those from which you receive most, and can carry most away, in the form either of knowledge or of stimulation. When you want to learn something about a subject, do not fall upon the first book which you have heard named or which professes by its title to deal with the subject. Consult your teacher, or any well-read friend, or the librarian of the nearest public library. (One of the greatest services public libraries render is that they provide librarians usually competent, and I believe always willing, to advise those who apply to them). Be content with nothing less than the very best you can get. Time will be saved in the end.

There is no waste more pitiable than that so often seen when some zealous student has, for want of guidance, spent weeks or months of toil in trying to obtain from a second- or third-rate book what he might have found sooner and better in a first-rate one. So try to read only what is good. And by "good" you will not suppose me to mean what used to be called "improving books," books written in a sort of Sunday School spirit for the moral benefit of the reader. A book may be excellent in its ethical tone, and full of solid information, and yet be unprofitable, that is to say, dull, heavy, uninspiring, wearisome. Contrariwise, a book is good when it is bright and fresh, when it rouses and enlivens the mind, when it provides materials on which the mind can pleasurably work, when it leaves the reader not only knowing more but better able to use the knowledge he has received from it.

Seventy years ago people, or at least those who used then to be called the preceptors of youth, talked as if there lay a certain virtue in dry books, or at any rate a moral merit in the process of plodding through them. It was a dismal mistake, and inflicted upon youth many a dreary hour. The dull book is not better than the lively book. Other things being equal, it is worse because it requires more expenditure of effort to master such of its contents as are worth remembering. If the edge of the tool is blunt, one must put forth more strength, and as there is never too much strength, none of it should be wasted. It may be asked, "But is not the mental discipline wholesome?" Yes, effort crowned with victory is a fine thing, but since there is plenty of such discipline to be had from the better books why go to the worst ones for it?

Sometimes it happens that what you want to learn cannot be had except from dry or even from dull treatises. Dryness and dullness are not the same thing, for the former quality may be due to the nature of the subject, but the latter is the fault of the author. Well, if there is no other book to be found, you must make the best of the dry and even of the dull. But first make quite sure that there are none better to be had, for though in many a subject the really satisfactory book has not yet been written, still in most subjects there is a large choice between the better and the worse.

Every book ought to be so composed as to be capable of being read with enjoyment by those who bring interest and capacity to it. One cannot be playfully various and graphically picturesque upon every kind of subject. Once, in a distant British colony, a friend of mine was asked by a person who knew that he came from the University of Oxford, "What do you think of Euclid?" My friend replied that Euclid's "Elements of Geometry"—if that was what the question referred to—was a valuable treatise, whose reputation had been established for many

centuries. "Yes," said the questioner, "but what do you think of Euclid's style?" My friend answered that he had always thought more about the substance than about the style of Euclid, but would be glad to know his questioner's opinion. "Well," said the latter, "I consider it quite a good style, but too systematic." Eloquence, variety, and wit are not the particular merits we look for in a scientific treatise, but however dry geometry or any other subject may appear, there is all the difference between a book which is well arranged and well expressed, a book which takes a grip of the mind and affords the pleasure of following out a line of logical thought, and a book which tumbles out facts and ideas in a confused and shapeless heap.

To the young, life seems a long vista with infinite possibilities. But, if you love learning, you will soon find that life is altogether too short for reading half the books from which you would like to cull knowledge. Let not an hour of it be wasted on third-rate or second-rate stuff if first-rate stuff can be had. Goethe once said of some one he knew, "He is a dull man. If he were a book, I would not read him." When you find that a book is poor, and does not give you even the bare facts you are in search of, waste no more time upon it.

The immensity of the field of reading suggests another question. Ought a man to read widely, trying to keep abreast of the progress of knowledge and thought in the world at large, or is it better that he should confine himself to a very few subjects, and to proceed not discursively but upon some regular system?

Each alternative has its advantages, but considering how rapidly knowledge is extending itself in all directions, and how every branch of it is becoming specialized, we must recognize that the range of attainment possible three or even two centuries ago is now unattainable even by the most powerful and most industrious minds. To-day the choice lies between superficiality in a larger, and some approach to thoroughness in a smaller, number of topics. Between these alternatives there can be no doubt as to your choice. Every man ought to be thorough in at least one thing, ought to know what exactness and accuracy mean, ought to be capable by his mastery of some one topic of having an opinion that is genuinely his own. So my advice to you would be to direct your reading chiefly to a few subjects, in one at least of which you may hope to make yourself proficient, and as regards other subjects, to be content with doing what you can to follow the general march of knowledge. You will find it hard—indeed impossible—to follow that march in the physical sciences, unless you start with some special knowledge of one or more of them. Many of the branches into which they have been diverging are now so specialized that the ordinary reader can hardly comprehend the

technical terms which modern treatises employ. But as respects travel and history and biography, and similarly as respects economics, the so-called "sociological subjects," art, and literary criticism, it is possible for a man who husbands his time and spends little of it on newspapers or magazines, to find leisure for the really striking books that are published on some of these topics which lie outside his special tastes. Do not, however, attempt to cover even the striking books on all of such topics. You will only dissipate your forces. Now and then a book appears which everybody ought to read, no matter how far it lies out of his range of study. It may be a brilliant poem. It may be a treatise throwing new light on some current question of home or foreign politics, about which every citizen, because he is a citizen, ought to try to have an opinion. It may be the record of some startling discovery in the realms of archæology, for instance, or in some branch of natural science. But such books are rare; and in particular the epoch-making scientific discoveries are seldom known at the time when the world first hears of them to be really epoch-making.

Two questions may, however, have presented themselves to you. One is this: Are there not some indispensable books which everyone is bound to read on pain of being deemed to be not an educated man? Certainly there are. Every language has its classics which those who speak the language ought to have read as part of a liberal education. In our own tongue we have, say, a score of great authors—it would be easy to add another dozen, but I wish to be moderate and put the number as low as possible—of whose works every one of us is bound to have read enough to enable him to appreciate the author's peculiar quality. These of course you must read, though not necessarily all or nearly all they have written. Spenser, for instance, is an English Classic, but even so voracious a reader as Macaulay admitted that few could be expected to persevere to the end of the "Faery Queene." Even smaller is the percentage of Dryden's works which a man may feel bound to read. Do not look for an opinion as to the percentage in the case of Robert Browning. The sooner you begin to read those who belong to this score, the better, for most of them are poets, and youth is the season in which to learn to love poetry. If you do not care for it then, you will hardly do so later.

The other question is, What about fiction? I can just recall an austere time, more than sixty years ago, when in Britain not a few moralists and educators were disposed to ban novel-reading altogether to young people and to treat it even among their elders as an indulgence almost as dangerous as the use of cards, dice, and tobacco. Exceptions, however, were made even by the sternest of these authorities. I recollect that one of them gave his imprimatur to two stories by an estimable Scottish

authoress—named Miss Brunton. These tales were entitled “ Discipline ” and “ Self-control,” and a perusal of them was well fitted to discourage the young reader from indulging any further his taste for imaginative literature. Permitted fiction being scanty, I did attack “ Self-control,” and just got through it, but “ Discipline ” was too much for me. Fiction is far more read now ; being abundant and cheaper, since it comes in the form of magazines as well as in books. But we have no Dickens, no Thackeray, no Hawthorne, no George Eliot.

Need anything more be said about fiction than that we should deal with it just as we should with other kinds of literature ? Read the best ; that is to say, read that from which you can carry away something that enlarges the range of your knowledge and sets your mind working. A good story, be it a historical romance or a picture of contemporary social conditions, gives something that is worth remembering. It may be a striking type of character, or a view of life and the influences that mould life, presented in a dramatic form. Or perhaps the tale portrays the aspects of society and manners in some other country, or is made a vehicle for an analysis of the heart and for reflections that illuminate some of the dark corners of human nature. Whichever of them it be that a powerful piece of fiction gives, the result is something more than mere transient amusement. Knowledge is increased. Thought is set in motion. New images rise before us. It is an enrichment of the mind to have erected within it a gallery of characters, the creation of imaginative minds, characters who become as real to us as the characters of history, to some of us possibly more real. In them we see the universal traits of human nature and learn to know ourselves and those around us better, we comprehend the common temptations and aspirations, the mixture of motives, the way in which Fortune plays with men. We share the possession of this gallery with other educated men. It is a part of the common stock of the world’s wealth.

MATTHEW ARNOLD

(1822-1888).

MATTHEW ARNOLD, the son of Dr. Arnold of Rugby, was born in 1822, at Laleham, near Staines. Winchester, Rugby and Balliol College, Oxford, contributed their best to his education. As early as 1843 he captured the Newdigate prize for his poem "Cromwell."

As a poet he owes his great popularity not so much to inspiration as to effort. He had no divine afflatus like Milton or even Browning—nay, his whole work is distinctly marked by his personal effort. It need not, however, be gathered from this that Matthew Arnold's poems lack harmony—indeed they are distinguished for their haunting and exquisite music.

Moreover, Arnold is famous for his pure and simple style. Simplicity is the keynote of all his works. Yet simple as is the language employed, the thought and ideas are as deep and sound as could be embodied in the most esoteric words. A disciple of Wordsworth, he possessed a sense of proportion and a gift of humour which saved him from the occasional errors of taste of the lake poet.

Matthew Arnold is no less eminent as a critic. However the place he holds as a critic is due more to his exquisite felicity in expression than to the actual penetration of his criticism. Nothing can exceed the easy grace of his prose at its best. His lucid writings exercised beyond doubt a most stimulating influence on his time.

In 1883 a pension of £250 was conferred on him in recognition of his literary merit. He then went to lecture in America, his subjects being "Emerson" and "Principles and Value of Numbers." Five years later the poet died suddenly of heart failure in Liverpool. In response to his own wish his remains are buried in the little churchyard of his birthplace.

SCIENCE AND LITERATURE

EXPERIENCE shows us that the generality of men will find more interest in learning that, when a taper burns, the wax is converted into carbonic acid and water, or in learning the explanation of the phenomenon of the dew, or in learning how the circulation of the blood is carried on, than they find in learning that the genitive plural of *pais* and *pas* does not take the

circumflex on the termination. And one piece of natural knowledge is added to another, and at last we come to propositions so interesting as Mr. Darwin's famous proposition that 'our ancestor was a hairy quadruped furnished with a tail and pointed ears, probably arboreal in his habits.' Or we come to propositions of such reach and magnitude as those which Professor Huxley delivers, when he says that the notions of our forefathers about the beginning and end of the world were all wrong, and that nature is the expression of a definite order with which nothing interferes.

Interesting, indeed, these results of science are, important they are, and we should all of us be acquainted with them. But what I now wish you to mark is, that we are still, when they are propounded to us and we receive them, we are still in the sphere of intellect and knowledge. And for the generality of men there will be found, I say, to arise, when they have duly taken in the proposition that their ancestor was "a hairy quadruped furnished with a tail and pointed ears, probably arboreal in his habits," there will be found to arise an invincible desire to relate this proposition to the sense in us for conduct, and to the sense in us for beauty. But this the men of science will not do for us, and will hardly even profess to do. They will give us other pieces of knowledge, other facts, about other animals and their ancestors, or about plants, or about stones, or about stars; and they may finally bring us to those great 'general conceptions of the universe which are forced upon us all,' says Professor Huxley, 'by the progress of physical science.' But still it will be knowledge only which they give us; knowledge not put for us into relation with our sense of conduct, our sense of beauty, and touched with emotion by being so put; not thus put for us, and therefore, to the majority of mankind, after a certain while, unsatisfying, wearying.

Not to the born naturalist, I admit. But what do we mean by a born naturalist? We mean a man in whom the zeal for observing nature is so uncommonly strong and eminent, that it marks him off from the bulk of mankind. Such a man will pass his life happily in collecting natural knowledge and reasoning upon it, and will ask for nothing, or hardly anything, more. I have heard it said that the sagacious and admirable naturalist whom we lost not very long ago, Mr. Darwin, once owned to a friend that for his part he did not experience the necessity for two things which most men find so necessary to them,—religion and poetry; science and the domestic affections, he thought, were enough. To a born naturalist, I can well understand that this should seem so. So absorbing is his occupation with nature, so strong his love for his occupation, that he goes on acquiring natural knowledge and reasoning upon it, and has little time or inclination for thinking about getting it related to the desire in man for conduct, the desire in man for beauty. He relates it to them for

himself as he goes along, so far as he feels the need : and he draws from the domestic affections all the additional solace necessary. But then Darwins are extremely rare. Another great and admirable master of natural knowledge, Faraday, was a Sandemanian. That is to say, he related his knowledge to his instinct for conduct and to his instinct for beauty, by the aid of that respectable Scottish sectary, Robert Sandeman. And so strong, in general, is the demand of religion and poetry to have their share in a man, to associate themselves with his knowing, and to relieve and rejoice it, that, probably, for one man amongst us with the disposition to do as Darwin did in this respect, there are at least fifty with the disposition to do as Faraday.

Education lays hold upon us, in fact, by satisfying this demand. Professor Huxley holds up to scorn mediæval education, with its neglect of the knowledge of nature, its poverty even of literary studies, its formal logic devoted to 'showing how and why that which the Church said was true must be true.' But the great mediæval Universities were not brought into being, we may be sure, by the zeal for giving a jejune and contemptible education. Kings have been their nursing fathers, and queens have been their nursing mothers, but not for this. The mediæval Universities came into being, because the supposed knowledge, delivered by Scripture and the Church, so deeply engaged men's hearts, by so simply, easily, and powerfully relating itself to their desire for conduct, their desire for beauty. All other knowledge was dominated by this supposed knowledge and was subordinated to it, because of the surpassing strength of the hold which it gained upon the affections of men, by allying itself profoundly with their sense of conduct, their sense for beauty.

But now, says Professor Huxley, conceptions of the universe fatal to the notions held by our forefathers have been forced upon us by physical science. Grant to him that they are thus fatal, that the new conceptions must and will soon become current everywhere, and that every one will finally perceive them to be fatal to the beliefs of our forefathers. The need of humane letters, as they are truly called, because they serve the paramount desire in men that good should be for ever present in them,—the need of humane letters, to establish a relation between the new conceptions and our instinct for beauty, our instinct for conduct, is only the more visible. The Middle Ages could do without humane letters, as it could do without the study of nature, because its supposed knowledge was made to engage its emotions so powerfully. Grant that this supposed knowledge disappears, its power of being made to engage the emotions will of course disappear along with it,—but the emotions themselves, and their claim to be engaged and satisfied, will remain. Now if we find by experience that humane letters have an

undeniable power of engaging the emotions, the importance of humane letters in a man's training becomes not less, but greater, in proportion to the success of modern science in extirpating what it calls ' mediæval thinking.'

Have humane letters, then, have poetry and eloquence, the power here attributed to them of engaging the emotions, and do they exercise it? And if they have it and exercise it, how do they exercise it, so as to exert an influence upon man's sense for conduct, his sense for beauty? Finally, even if they both can and do exert an influence upon the senses in question, how are they to relate to them the results,—the modern results,—of natural science? All these questions may be asked. First, have poetry and eloquence the power of calling out the emotions? The appeal is to experience. Experience shows that for the vast majority of men, for mankind in general, they have the power. Next, do they exercise it? They do. But then, how do they exercise it so as to affect man's sense for conduct, his sense for beauty? And this is perhaps a case for applying the Preacher's words: ' Though a man labour to seek it out, yet he shall not find it; yea, farther, though a wise man think to know it, yet shall he not be able to find it.' Why should it be one thing, in its effect upon the emotions, to say, " Patience is a virtue " and quite another thing, in its effect upon the emotions, to say with Homer, " for an enduring heart have the destinies appointed to the children of men " ? Why should it be one thing, in its effect upon the emotions, to say with the philosopher Spinoza, *Felicitas in eo consistit quod homo suum esse conservare potest*—" Man's happiness consists in his being able to preserve his own essence," and quite another thing, in its effect upon the emotions, to say with the Gospel, " What is a man advantaged, if he gain the whole world, and lose himself, forfeit himself? " How does this difference of effect arise? I cannot tell, and I am not much concerned to know; the important thing is that it does arise, and that we can profit by it. But how, finally, are poetry and eloquence to exercise the power of relating the modern results of natural science to man's instinct for conduct, his instinct for beauty? And here again I answer that I do not know how they will exercise it, but that they can and will exercise it I am sure. I do not mean that modern philosophical poets and modern philosophical moralists are to come and relate for us, in express terms, the results of modern scientific research to our instinct for conduct, our instinct for beauty. But I mean that we shall find, as a matter of experience, if we know the best that has been thought and uttered in the world, we shall find that the art and poetry and eloquence of men who lived, perhaps, long ago, who had the most limited natural knowledge, who had the most erroneous conceptions about many important matters,

we shall find that this art, and poetry, and eloquence, have in fact not only the power of refreshing and delighting us, they have also the power—such is the strength and worth, in essentials, of their author's criticism of life,—they have a fortifying, and elevating, and quickening, and suggestive power, capable of wonderfully helping us to relate the results of modern science to our need for conduct, our need for beauty. Homer's conceptions of the physical universe were, I imagine, grotesque ; but really, under the shock of hearing from modern science that ' the world is not subordinated to man's use, and that man is not the cynosure of things terrestrial,' I could, for my own part, desire no better comfort than Homer's line which I quoted just now, ' for an enduring heart have the destinies appointed to the children of men ' !

And the more that men's minds are cleared, the more that the results of science are frankly accepted, the more that poetry and eloquence come to be received and studied as what in truth they really are,—the criticism of life by gifted men, alive and active with extraordinary power at an unusual number of points ;—so much the more will the value of humane letters, and of art also, which is an utterance having a like kind of power with theirs, be felt and acknowledged, and their place in education be secured.

Let us therefore, all of us, avoid indeed as much as possible any invidious comparison between the merits of humane letters, as means of education, and the merits of the natural sciences. But when some President of a Section for Mechanical Science insists on making the comparison, and tells us that ' he who in his training has substituted literature and history for natural science has chosen the less useful alternative,' let us make answer to him that the student of humane letters only, will, at least, know also the general conceptions brought in by modern physical science ; for science, as Professor Huxley says, forces them upon us all. But the student of the natural sciences only, will, by our very hypothesis, know nothing of humane letters ; not to mention that in setting himself to be perpetually accumulating natural knowledge, he sets himself to do what only specialists have in general the gift for doing genially. And so he will probably be unsatisfied, or at any rate incomplete, and even more incomplete than the student of humane letters only.

I once mentioned in a school-report, how a young man in one of our English training colleges having to paraphrase the passage in *Macbeth* beginning, " Canst thou not minister to a mind diseased ? " turned this line into, " Can you not wait upon the lunatic ? " And I remarked what a curious state of things it would be, if every pupil of our national schools knew, let us say, that the moon is two thousand one hundred and sixty miles in diameter, and thought at the same time that a good

paraphrase for "Canst thou not minister to a mind diseased?" was, "Can you not wait upon the lunatic?" If one is driven to choose, I think I would rather have a young person ignorant about the moon's diameter, but aware that "Can you not wait upon the lunatic?" is bad, than a young person whose education had been such as to manage things the other way.

Or to go higher than the pupils of our national schools. I have in my mind's eye a member of our British Parliament who comes to travel here in America, who afterwards relates his travels, and who shows a really masterly knowledge of the geology of this great country and of its mining capabilities, but who ends by gravely suggesting that the United States should borrow a prince from our Royal Family, and should make him their king, and should create a House of Lords of great landed proprietors after the pattern of ours; and then America, he thinks, would have her future happily and perfectly secured. Surely, in this case, the President of the Section for Mechanical Science would himself hardly say that our member of Parliament, by concentrating himself upon geology and mineralogy, and so on, and not attending to literature and history had 'chosen the more useful alternative.'

HERBERT HENRY ASQUITH

(1852-).

MR. ASQUITH'S name will always be associated with one of the most momentous periods in English social and political history. He held the highest office at a time when feeling and opinion were sharply divided on several important issues, and he acquitted himself always prudently and sometimes with the decisive vigour of the statesman. Three measures, the Parliament Act of 1911, the Irish Home Rule bill of 1912, and the Coal Mines (Minimum Wage) Act of the same year, will serve to indicate the difficulties with which he had to contend and the resolute manner in which he overcame them. Of him, indeed, a biography would be little less than a political history of the years immediately before and at the opening of the twentieth century.

After a brilliant Oxford career he attained to a fair practice at the Bar, though ambitious of parliamentary rather than forensic distinction. He came of a Liberal family, and a Liberal he has remained ever since his university and Union days. In 1886 he was elected for East Fife, and soon attracted the notice of Mr. Gladstone by his speeches and his sound political judgment.

The defeat of the Liberals in 1895 deprived him of the Home Office where he had served in the last Gladstone administration, and for eleven years he was out of office. In 1903-1906 when Mr. Chamberlain was conducting a strenuous tariff-reform campaign, it was Mr. Asquith as the chief speaker of the Liberals who did much to counteract his efforts by his speeches for Free Trade.

Thus, by the time of Mr. Balfour's resignation in December, 1905, he had become so prominent as to make certain a position in the new Ministry. He was appointed Chancellor of the Exchequer under Sir H. Campbell-Bannerman. The Premier's ill-health, however, left the practical leadership of the Commons to Mr. Asquith, and when Sir Henry resigned in 1908 he was regarded as the natural successor to the office. He appointed to the Exchequer Mr. Lloyd George, whose budget of the following year led to the general election of 1910. Liberals and Unionists came back in almost equal numbers and the Labour and Irish

parties held the key of the situation. Though in a difficult situation, Mr. Asquith prepared for his attack on the power of the House of Lords.

The King's death in May, 1910, only caused a postponement of the struggle. It was a notable Parliamentary crisis involving a serious constitutional issue, no less than the replacement of unwritten constitutional tradition by statutory definition. By a dissolution, and a confirmation of his programme by the public, by the help of Labour and Nationalists, by a repeated use of the closure, and above all by a promise from the Crown to create sufficient peers to overcome the Opposition, and not least by the firmness with which he met the violent, and at times disorderly, exasperation of the Opposition, Mr. Asquith carried a bill which has justly been called "a landmark in political development."

The three years following were spent on the pressing forward, again with a stringent use of the closure, of the Irish Home Rule and the Welsh Disestablishment bills. As for the former, in spite of all his efforts, the Ulster obstruction delayed its passing until the outbreak of war diverted attention. #

The war years are too recent in memory for us to view the men and their actions with impartiality. Mr. Asquith's administration previous to the war had been that of a zealous and determined reformer. He had pushed on with unremitting vigour and unchanging purpose. But the outbreak of war left him unsure and hesitating, with a 'hesitating Cabinet and a hesitating Party' behind him. He did not, indeed, delay in expressing the country's obligation and determination to stand by Belgium and France, nor at times when colleagues drew back from measures repugnant to them did he fail in decisive action; but when at the end of 1916 Mr. Lloyd George delivered what was an ultimatum of his own to the Cabinet and, on its refusal, resigned, Mr. Asquith felt bound to surrender his leadership of an administration that had not satisfied the country's demand for a greater efficiency in the prosecution of the war.

In 1918 he published a volume of Occasional Speeches, and the book is a testimony to his scholarship and taste, qualities which have gained him the rectorship first of Glasgow and then of Aberdeen, together with honorary degrees from many of the universities. In 1923 appeared "The Genesis of the War," a clear and valuable account of the events that led to the catastrophe of 1914.

Losing his seat in the election of 1918 he did not return to Parliament till February, 1920. In December of the next year he saw passed the Articles of Agreement that concluded the long Irish struggle

for independence, for which he had laboured while in office. The last few years have seen a sudden decline in the fortunes of Liberalism, and the Party is now the smallest in the House. Mr. Asquith, while still the nominal leader of the Party, was created in 1925, Earl of Oxford and Asquith, and left the Commons for the Lords.

THE LORDS AGAINST THE CONSTITUTION

(Address by Mr. Asquith, as Prime Minister, in the House of Commons, December 2nd, 1909, on Moving the Resolution of Protest that the Refusal of the House of Lords to Pass the Budget was a Breach of the Constitution and a Usurpation of the Rights of the Commons)

WE are met here this afternoon under circumstances which are unexampled in the history of the British Parliament. . . .

For the first time in English history, the grant of the whole of the Ways and Means for the Supply and Service of the year—a grant made at the request of the Crown to the Crown by the Commons—has been intercepted and nullified by a body which admittedly has not the power to increase or to diminish one single tax, or to propose any substitute or alternative for any one of the taxes. The House of Commons would, in the judgment of his Majesty's Government, be unworthy of its past and of the traditions of which it is the custodian and the trustee if it allowed another day to pass without making it clear that it does not mean to brook the greatest indignity, and I will add, the most arrogant usurpation, to which, for more than two centuries, it has been asked to submit. . . .

We live in this country, and we have lived for centuries past, under an unwritten Constitution, although some signs in the sky would seem to portend that that happy state of things is not likely long to last. It is, of course, true that we have upon the statute book great instruments, like Magna Charta itself, the Petition of Rights and the Bill of Rights, which define and secure many of our rights and privileges; but the great bulk of our constitutional liberties—and, I would add, of any constitutional practices—do not derive their validity and sanction from any Bill which has received the formal assent of King, Lords and Commons. They rest upon usage, upon custom, upon conviction—often of slow growth, in their early stages, not always uniform, but which in the course of time have received universal observance and respect; and let me

point out further, it is an essential incident of such an unwritten Constitution that there should be powers which are legal powers—legal powers in the sense that their exercise cannot be questioned in any court of law, yet which, in the course of time, and by the effect of such usages as I have described, first of all came to be fitfully and intermittently used, and finally in the progress of our development became dormant, moribund, and for all practical purposes dead.

A familiar illustration of this, well known to everybody, is the Veto of the Crown. There is nothing whatever to prevent me or any other Minister from advising his Majesty to-morrow to refuse his assent to a Bill which has passed through both the House of Commons and the House of Lords ; and, if his Majesty were to take that advice, and so refuse his assent, that Bill could not take its place on the statute book, and would not have its effect in law. I think, however, the Minister who gave that advice would deserve to be impeached, although, in point of law, the right of the Crown to veto a Bill is just as unquestionable to-day as it was in the time of Queen Elizabeth. But 200 years of desuetude and contrary practice have made it a legal right not constitutionally exercised or followed now.

I saw a speech the other day—I think by the Member for East Worcestershire (Mr. Austen Chamberlain)—in which he derided the distinction which my noble and learned friend the Lord Chancellor had drawn between that which is legal and that which is constitutional, and said that the antiquarianism and the pedantry of lawyers left him quite cold. It was pedantry of this kind—the pedantry which realizes and dwells upon the distinction between the genius and the spirit of our Constitution on the one side, and the bare and barren letter of the law upon the other—it was pedantry of this kind which made and saved the liberties of England. It was pedants, like Pym and Selden and Somers, who rescued this House, largely through the power of the purse, from the domination of the Crown. We need not be ashamed to be called by the same name and to bear the same reproach if, acting in the same spirit and using largely the same weapons, we put an end to the usurpations of the House of Lords.

Tried by the test which I have been endeavouring to describe—the test of usage, the test of convention, the test of unbroken understanding, does not the recent action of the House of Lords in rejecting the Finance Bill deserve the description which I have given to it in my Resolution ? Is it not a breach of the Constitution ? No one will deny that the House of Lords has a technical right to reject a Finance Bill or any other Bill. I certainly am not in the least concerned to deny that there have been cases in the old days in which this House has

acquiesced, though rarely without protest, not only in the rejection, but in the amendment of Bills which were concerned with the taxation of the country. For the most part these cases were trivial, and even trumpery in their character ; but ever since 1628—I do not need to go further back than that to establish constitutional usage—when by the advice of the greatest lawyers of that day the mention of the Lords was deliberately omitted from the granting words in the preamble of Supply Bills, this House has asserted, with ever-growing emphasis, its own exclusive right to determine the taxation and the expenditure of the country. The demand, as I pointed out already, in the speech from the Throne for Supply, is made every year by the Crown to the Commons, and to the Commons alone, and the answer to that demand comes from the Commons, and from the Commons alone.

I will not weary the House by citing authorities ; but I will quote the words of one who is entitled to rank among the greatest of all of them—a man who earned for himself by his services to this House and to his country in his day the title of the Great Commoner—the first William Pitt. He stated in words which have become classic :

“ Taxes are a voluntary grant and gift of the Commons alone, and the concurrence of the Crown and the Peers to a tax is only necessary to clothe it with the form of law.”

That exactly stated the case as it was then, and as 130 years afterwards it remains to-day. . . .

A year ago, indeed, I may say, until about six weeks ago, whatever expressions may have been used from time to time by one statesman or another as to the technical and legal rights of the House of Lords, what I have been saying during the last ten minutes would have been looked upon as a truism. It would have been universally admitted as a correct and entirely unexaggerated statement of our constitutional practice. I need not go further back in support of that proposition than two years ago, in the month of June, 1907. In that month my predecessor, Sir Henry Campbell-Bannerman, proposed, and this House carried, a Resolution in favour of limiting the veto of the House of Lords in legislation, a Resolution which remains recorded in our journals, which it is quite unnecessary at this moment to reaffirm. But in the course of that debate not even the most tenacious stickler for the extremest view of the privileges of the House of Lords claimed, and not the most uncompromising critic of the House of Lords thought it necessary to deny, the alleged right which is now put forward. I am quite content to take upon that point the statement of the right honourable gentleman, the Leader of the Opposition. I will read his words, because no language more germane to the topic which we are considering to-day could possibly

be cited from any speech which has been delivered in our time. The right honourable gentleman said this on June 24th, 1907 :

“ We all know that the power of the House of Lords ”—

He speaks of some limitations which are not material—

“ is still further limited by the fact that it cannot touch those Money Bills, which if it could deal with, no doubt it could bring the whole executive machinery of the country to a standstill.”

I pause here to make two observations. I assume that if you cannot touch a thing you cannot kill it. That is my first observation, and the second is that the right honourable gentleman showed, as might be expected of him with his large administrative experience, what would be the result of the House of Lords touching a Money Bill, if it were so ill-advised as to do so, that it would bring the whole executive machinery of the country to a standstill.

How does the right honourable gentleman go on ?

“ The conclusion which I want to press upon the House, and which is all important in this matter, is that under our existing system you have two Chambers, which are not of equal power, which are not of equal authority, which cannot come into serious conflict in the whole field of administration, in the whole field of the initiation of legislation, or in the whole field of that legislation which deals with finance.”

As the result of our constitutional usage the House of Lords was in a position of admitted, if you like, inferiority, or if you like, limitation or incapacity, with regard to certain matters of which finance is one, which made it impossible to come into serious collision with the House of Commons. In other words, in regard to such matters as that, the will of the House of Commons must, according to constitutional practice, be supreme. I do not want any higher testimony than that. Of course, we shall be interested to learn how, if at all, and for what reasons, the right honourable gentleman has contradicted the view which only two years ago he authoritatively expressed.

I am not going to discuss in reference to this unprecedented act the merits of the Finance Bill with the House of Lords, but I think it is only right and fair before I bring my case to a conclusion that I should examine such justifications as have been put forward for the action which has been taken. In the first place, I have seen it suggested, with, I think, increasing faintness of conviction, that this Bill was not a Finance Bill at all, and that, therefore, the constitutional rule does not apply. That, of course, is one of the most absurd contentions which has ever been advanced by a barren controversialist. Here is a Bill of nearly 100 clauses, which imposed ten or eleven different sets of taxes. I will undertake to say there was not a single clause which was not relevant

to its primary and governing purpose, namely, the raising of revenue. The only object ever suggested in a contrary sense is the somewhat elaborate provisions which were made for valuation ; and in regard to that I may point out again, what has often been pointed out before, that if you are imposing a new set of taxes upon a new taxable subject you will be guilty of, at any rate, unbusinesslike conduct if you do not provide adequate machinery for assessment and collection, and my right honourable friend in this respect was only following the precedent set up by Sir Robert Peel in 1842 in the Income Tax Act, by Mr. Gladstone in 1853 in the Succession Duty Act, and by Sir William Harcourt in the Finance Act of 1894.

But there is another reason which is put forward by way of justification which I think demands rather fuller scrutiny. The House of Lords, or their apologists, tell us that they have not rejected this Bill. All they have done is to refer it to the people. I want to examine this doctrine of the power or the duty of the House of Lords to refer certain sorts of Bills to the people a little more closely than has been done, at any rate in this House. What does it amount to ? Hitherto, when any government has received the assent of the House of Commons to its financial resolutions, it has been assumed on all hands that in substance they would pass into law. Taxes have been paid, received, collected, even demanded, on the strength of these Resolutions. What would be the case if this precedent of a reference of the Finance Bill to the people is once adopted and acted upon ? No government will be safe—when I say no government, of course I mean no Liberal Government—in following what has hitherto been the universal practice. Of course, it cannot tell whether the House of Lords may not, later on in the summer, or even as this year late in the autumn, be minded at the last moment to refer the whole of these taxes to the people. When you come to analyze it, it means that the House of Lords will have the power to compel the executive of the day to adopt one of three courses—firstly, to submit a new Budget to the House of Lords to meet with their approval ; secondly, to send up again, and perhaps time after time, their old Budget, with no provision in the meantime, or no adequate provision for the financial necessities of the State ; or finally, to advise the Crown to dissolve Parliament. These are entirely novel claims, and they ought not to be allowed to pass without clear, emphatic and immediate protest.

On what are they founded ? They are founded, as I say, on what I believe to be an entirely novel assumption that the House of Lords has the right, if it does not like a Bill, to compel a reference to the electorate. I assert, on the contrary, two very simple propositions. The first,

is that the presumption always is that the House of Commons, freely chosen by the people, represents the will of the people ; and the second is that there is no presumption of any sort or kind as regards the House of Lords. I would say, parenthetically, I am quite willing and anxious, so far as the House of Commons is concerned, that that presumption should be strengthened and re-enforced by shortening the duration of Parliament, and therefore, by a more frequent contact between the elected body and the electorate ; but this new-fangled Cæsarism which converts the House of Lords into a kind of plebiscitary organ is one of the quaintest inventions of our time. Let us see what it is. I will try to put the theory as plausibly as I can against myself. The theory is that the people require to be protected against their own elected representatives, especially—may I not say exclusively ?—when the majority of those representatives happen to belong to the Liberal Party. By whom is the protection to be afforded ? In what quarter is it to be found ? Here the theory goes on that Providence, as in so many other ways, has been exceptionally kind. It has supplied us with exactly the kind of thing we want for the purpose by an unforeseen and unforeseeable evolution in our ancient House of Lords.

It is true that at first sight the uninstructed observer of an Assembly, which is composed in the proportion, I suppose, of somewhere between twenty and ten to one of members of a single political party, might not seem to be pre-eminently qualified to exercise a judicial or quasi-judicial function ; but here again Providence steps in, and it would seem that either at birth, or, as the case may be, upon creation of a peer, who receives a patent of peerage, there descends upon the favoured individual what I may call a kind of instinct of divination which enables him at all times thereafter to discern to a nicety, provided always that a Liberal Government is in power, the occasions and the matters in regard to which the people's representatives are betraying the people's trust. We are sometimes told by sceptical people that the age of miracles is past. If the theory which I have just been endeavouring—I hope without exaggeration—to enunciate is anything like true, then the whole British Constitution depends on the offchance of a succession of miraculous events.

The truth is that all this talk about the duty or the right of the House of Lords to refer measures to the people is, in the light of our practical and actual experience, the hollowest outcry of political cant. We never hear of it, as I pointed out, when a Tory Government is in power. It is never suggested when measures are thrust by a Tory majority by the aid of the guillotine and the closure, and all the rest of it, through this House—measures which, unlike every one of the governing provisions

of the Budget of the present year, have never been approved or even submitted to the electorate. It is simply a thin rhetorical veneer, by which it is sought to gloss over the partisan, and in this case the unconstitutional, action of a purely partisan Chamber. The sum and substance of the matter is that the House of Lords rejected the Finance Bill last Tuesday, not because they love the people, but because they hate the Budget.

This motion, which I am now about to propose, is confined in terms to the new and unprecedented claim made by the House of Lords to interfere with finance. But I am sure, in fact, I know I am speaking the mind of my colleagues, and, I believe, of the great bulk of those who are sitting on this side of the House, when I say that it represents a stage—a momentous and, perhaps, a decisive stage—in a protracted controversy which is drawing to a close. The real question which emerges from the political struggles in this country for the last thirty years is not whether you will have a single or a double chamber system of government, but whether when the Tory Party is in power the House of Commons shall be omnipotent, and whether when the Liberal Party is in power the House of Lords shall be omnipotent.

We are living under a system of false balances and loaded dice. When the democracy votes Tory we are submitted to the uncontrolled domination of a single Chamber. When the democracy votes Liberal, a dormant Second Chamber wakes up from its slumbers and is able to frustrate and nullify our efforts, as it did with regard to education, as it did with regard to licensing, as it has done again this year with regard to measures for Scotland, and with regard to finance. I cannot exhaust the list ; it would be too long. They proceed to frustrate and nullify the clearest and most plainly-expressed intention of the elective House.

The House of Lords have deliberately chosen their ground. They have elected to set at naught in regard to finance the unwritten and time-honoured conventions of our Constitution. In so doing, whether they foresaw it or not, they have opened out a wider and a more far-reaching issue. We have not provoked the challenge, but we welcome it. We believe that the first principles of representative government, as embodied in our slow and ordered but ever-broadening constitutional development, are at stake, and we ask the House of Commons by this Resolution to-day, as at the earliest possible moment we shall ask the constituencies of the country, to declare that the organ, the voice of the free people of this country, is to be found in the elective representatives of the nation.

LORD AVEBURY

(1834-1913).

JOHAN LUBBOCK, the son of Sir J. W. Lubbock a distinguished scientist, was himself a naturalist, banker and politician. His busy life was devoted equally to science and public affairs. He served on financial commissions and effected several reforms in banking, one of them being the Bank Holidays Act of 1871. He sat in Parliament first for Maidstone and later for London University, whose vice-chancellor he became in 1872, and was instrumental in passing bills dealing with shop hours regulations, public libraries, open spaces and the preservation of ancient monuments. He held many positions of distinction, being at various times president of the Entomological Society, of the Anthropological Institute, of the British Association, and, from 1881 to 1886, of the Linnæan Society. Later he became chairman of the London County Council. In 1900 he was raised to the peerage under the title of Baron Avebury.

He was very popular in his day as a writer on natural history, as is shown by the numerous editions of such books as "British Wild Flowers" (1875) and "Ants, Bees and Wasps" (1882). To-day he is known rather as the author of "The Pleasures of Life" (1887), and "Prehistoric Times."

ADDRESS ON READING

(Delivered at Manchester, 1903).

NO one can read a good and interesting book for an hour without being the better for it; happier and better, not merely for the moment, but the memory remains with us—stores of bright and beautiful thoughts which we can call up when we will. "The ink of the student," says an Arab proverb, "is as precious as the blood of the martyr."

It is indeed most important that those who use a library should use it wisely. Do we make most of our opportunities? It is a great

mistake to imagine that every one knows how to read. On the contrary, I should say that few do so. Two things have to be considered : how to read and what to read.

Every one thinks he knows how to read and write. This is, I believe, quite a delusion. I will not enter into the eccentricities of handwriting, but as to reading there seem to be two very common mistakes. The first is that many people seem to think that they will get the greatest enjoyment from reading by reading that which they enjoy most. That this is quite a fallacy can, I think, easily be shown.

Suppose—and I think this rather an extreme case—that a story book is five times as entertaining as, let us say, a history. For the first day there is no doubt a considerable balance in favour of the story, but in six months the balance will be turned, and will soon be heavily in favour of the history. I am here, moreover, speaking merely of the pleasure, without considering the solid advantages.

A second error is to suppose that a real reader can be passive. Passive reading, however, is of very little use. It is not enough to run the eyes mechanically over the lines, to recognise the words, and to turn over the leaves. We must exercise the reason and the imagination ; endeavour to call up the scenes depicted, to realise the characters described, to picture them in the gallery of the imagination. Thus only can we do justice to a really good book.

Among all the great discoveries of the nineteenth century, one of the greatest was the importance of education. Even so wise and good a man as Dr. Johnson was afraid that if every one learnt to read, there would be no one willing to do the manual work of the world. He did not realise the dignity and interest of labour.

An appreciation of literature is now more general, but the wisest of men have always fully recognised its value.

"Of all treasures," says the Hitopadesa, "knowledge is the most precious, for it cannot be stolen, given away, nor consumed."

"Education," said Plato, "is the fairest thing that the best of men can ever have." Coming to our own country, Shakespeare tells us that

"Ignorance is the curse of God ;
Knowledge the wing wherewith we fly to heaven."

"When I look back," said the late Sir J. Fitch, "on my own life, and think on the long-past school and college days, I know well that there is not a fact in history, not a formula in mathematics, not a rule in grammar, not a sweet and pleasant verse of poetry, not a truth in science which I ever learned, which has not come to me over and over again in the most unexpected ways, and proved to be of greater use than I could

ever have believed. It has helped me to understand better the books I read, the history of events which are occurring round me, and to make the whole outlook of life larger and more interesting."

If people understood better the art of reading—what to read and how to read—their lives would be much happier, brighter, and more useful. We cannot be too thankful for the blessing of books. Lamb remarked that we say grace before dinner, but he thought we ought to do so before beginning a good book.

Macaulay had wealth and fame, rank and power, and yet he tells us in his biography that he owed the happiest hours of his life to books. In a charming letter to a little niece, he says, "Thank you for your very pretty letter. I am always glad to make my little girl happy, and nothing pleases me so much as to see that she likes books, for when she is as old as I am she will find that they are better than all the tarts and cakes, toys and plays and sights in the world. If any one would make me the greatest king that ever lived, with palaces and gardens and fine dinners, and wings and coaches, and beautiful clothes, and hundreds of servants, on condition that I should not read books, I would not be a king. I would rather be a poor man in a garret with plenty of books than a king who did not love reading."

Knowledge lights up the history of the world, and makes it one bright path of progress; it enables us to appreciate the literature of the world; it opens for us the book of Nature, and creates sources of interest wherever we find ourselves.

Let us just consider how much better off we are than our ancestors were in ancient times. In the first place, to say nothing of the advantages of print, how much cheaper books are. For the price of a little beer, or one or two pipes of tobacco, a man can buy as much as he can read in a month; in their day, on the contrary, books were very expensive. Again, while our books are small and handy, theirs were ponderous and immense—very inconvenient either to hold or to read. Even our most learned books are in one sense light reading.

Again, how many of the most interesting books are by modern, many by living, authors.

Books are peculiarly necessary to the working men in our towns. Their life is one of such monotony. The savage has a far more varied existence. He must watch the habits of the game he hunts, their migrations and feeding-grounds; he must know where and how to fish; every month brings him some fresh occupation and some change of food. He must prepare his weapons and build his own house; even the lighting of a fire, so easy now, is to him a matter of labour and skill. The agricultural labourer turns his hand to many things. He ploughs

and sows, mows and reaps. He plants at one season, uses the bill-hook and the axe at another. He looks after the sheep and pigs and cows. To hold the plough, to lay a fence, or tie up a sheaf, is by no means so easy as it looks. It is said of Wordsworth that a stranger having on one occasion asked to see his study, the maid said, "This is master's room, but he studies in the fields." The agricultural labourer learns a great deal in the fields. He knows much more than we give him credit for. It is field-learning, not book-learning, but none the worse for that.

On the other hand, the man who works in a shop or manufactory has a much more monotonous life. He is confined to one process, or, perhaps, even one part of a process, from year's end to year's end. He acquires, no doubt, a skill little short of miraculous, but, on the other hand, very narrow. If he is not himself to become a mere animated machine, he must generally obtain, and in some cases he can only obtain, the necessary variety and interest from the use of books.

English literature is the birthright of our race. We have produced and are producing some of the greatest of poets, of philosophers, of men of science. No race can boast of a better, purer, or nobler literature—richer than our commerce, more powerful than our arms. It is the true pride and glory of our country, and we cannot be too thankful for it. It is no exaggeration to say that books endow us with an enchanted palace of bright and happy thoughts. A library has been said to be a true university; it is also a fairyland, a haven of repose from the storms and troubles of the world.

We hear much about English commerce and manufactures; although there seems no reason for despondency, there is every reason for exertion, and we must not throw away a chance. Many and great as have been the discoveries of the last century, the resources of science are not exhausted. No doubt some of the discoveries of the future will be made by great philosophers. But I doubt not that the workman and, as I hope, the British workman, will bear his part in the years to come, as he has in those that are gone by.

Watt was a mechanical engineer; Henry Cort, whose improvements in manufactures are said to have added more to the wealth of England than the whole value of the National Debt, was the son of a brickmaker; Huntsman, the inventor of steel, was a watchmaker; Wedgwood was a potter; Crompton was a weaver; Brindley, Telford, Mushet, and Neilson were working men; George Stephenson began life as a cowboy at twopence a day, and could not read until he was eighteen. Dalton was the son of a weaver; Faraday, of a blacksmith; Newcomen, of a blacksmith; Arkwright began as a barber; Sir Humphrey Davy was an apothecary's apprentice; Boulton, "the father of Birmingham,"

was the son of a button-maker ; Watt, of a carpenter. To these men, and others like them, the world owes a deep debt of gratitude. We ought to be as proud of them as of our great generals and statesmen.

Is it not also delightful to think how many happy hours have been, and how many we may safely hope will be, spent within these walls—how much these volumes will have added to the happiness of your homes ? A library is a true paradise in which everything is open to us, especially the fruit of the tree of knowledge, for which we are told that our first mother sacrificed all the delights of the Garden of Eden.

You will have no doubt times of sorrow, of suffering, and of anxiety. Even in such cases the treasures on your shelves may do much to relieve, to comfort, and to console. But there is one unnecessary trouble in life from which many suffer much—that of dullness and monotony, and at least I may congratulate you that no one with books need ever be dull.

FRANCIS BACON

(1561-1626).

FRANCIS BACON, Baron Verulam and Viscount St. Albans, is called by one of his contemporaries "the eloquentest man in England." Perhaps those who read his legal arguments before the Star Chamber may not find this eloquence so fully exemplified in them as in his incomparable essays; but, wherever he speaks, it is Francis Bacon's unequivocal style and language. It is doubtful if any other man ever lived who has even approached him in the power of controlling his own and subsequent times by purely intellectual means. Until his time Aristotle had no rival in the domain of pure intellect, and since he lived it is to his "inductive method" that Science has been indebted for one of its most potent instruments of progress.

The life and character of Bacon form a strange contrast and justify Pope's epigrammatic judgment of him as the "greatest, wisest, meanest of mankind." The empirical philosopher and the author of the noblest moral essays in English was also the persistent petitioner for office, the treacherous friend of Essex, the vindictive rival of Coke and the corrupt Lord High Chancellor of England.

He was the son of Sir Nicholas Bacon, Elizabeth's Lord Keeper of the Great Seal. His father died before Bacon could be safely placed in a good official position, and from his powerful uncle, Lord Burghley, whom he solicited he received nothing. So he became a barrister, still with an eye to political advancement. In 1584 he was member for Taunton and, though a young man of twenty-three, soon sought to attract attention by addressing some advice to the Queen on her treatment of recusants. But the Government ignored him, and he sought the patronage of the unfortunate Essex. Essex' favour with the Queen did not survive his military failure in Ireland, and Bacon, fearful evidently of sharing his friend's disgrace, voluntarily offered to secure Essex' conviction for treason. He pleaded that the claims of state must always over-ride those of friendship. With the accession of James in 1603 his fortunes turned and his extravagant and assiduous flattery won him the favour of the new King. He rose to be in turn King's Counsel, Solicitor General and Attorney-General. His income must have been large and, if he did not marry for money, he went where money was; but his

incurable extravagance seems to have kept him constantly in need of money. In 1618, through the King's favour and the patronage of Buckingham, to whom he was ignominiously servile, he attained the coveted Lord High Chancellorship and was raised to the peerage as Baron Verulam. He failed singularly in the responsibilities of his office, allowing himself to be illegally influenced by Buckingham and accepting bribes. In 1621 he was subjected to a Parliamentary enquiry. Twenty-three charges of corruption were brought against him. He confessed to them all. His punishment was heavy. He was soon released from it and pardoned, but his disgrace was full and complete. He was not allowed to return to court and he retired to his estate near St. Albans to devote himself to philosophical work.

In 1597 he had published ten of his Essays. When they were reprinted in 1612 they had increased to thirty-eight. By 1625 they appeared 'newly written' and fifty-eight in number. These form his best, most popular and most enduring work, and by these rather than by the fragmentary "Instauration of the Sciences" he will always be known. The latter was intended and sketched as a vast compendium of all knowledge. Two portions were written, "The Advancement of Learning" (1605) and the "Novum Organum" (1620). It cannot be pretended that they are widely read to-day. Better known is the "New Atlantis," one of the many philosophical romances of Utopian islands where a perfect social system makes possible a life of ennobling labour and exquisite culture. It is in the line of succession from Plato's "Republic" to Mr. Wells' "Men Like Gods."

Of Bacon's "Essays" praise is superfluous; their virtues are known to all, or can be known by reading them. Nor does space or occasion admit of an exposition of his philosophical system. For his eloquence he is highly extolled by Ben Jonson, whose opinion is weighty enough and whose praise was never unworthily bestowed.

The standard edition of Bacon's works is the monumental one (14 volumes 1857-74) of Spedding, Ellis and Heath. There is also Macaulay's brilliant essay; a monograph by Dean Church and a short life by Dr. Abbott. His address to the Star Chamber on Duelling was delivered in the proceedings against Mr. William Priest for writing and sending a challenge, and Mr. Richard Wright for carrying it, on January 26th, 1615, Bacon being the King's Attorney-General. The text is from T. B. Howell's "State Trials," London, 1816.

AGAINST DUELLING

MY LORDS, I thought it fit for my place, and for these times, to bring to hearing before your lordships some cause touching private duels, to see if this court can do any good to tame and reclaim that evil, which seems unbridled. And I could have wished that I had met with some greater persons, as a subject for your censure ; both because it had been more worthy of this presence, and also the better to have shown the resolution I myself have to proceed without respect of persons in this business. But finding this cause on foot in my predecessor's time, I thought to lose no time in a mischief that groweth every day ; and besides, it passes not amiss sometimes in government, that the greater sort be admonished by an example made in the meaner, and the dog to be eaten before the lion. Nay, I should think, my lords, that men of birth and quality will leave the practice, when it begins to be vilified, and come so low as to barber-surgeons and butchers, and such base mechanical persons. And for the greatness of this presence, in which I take much comfort, both as I consider it in itself, and much more in respect it is by his Majesty's direction, I will supply the meanness of the particular cause, by handling of the general point : to the end that by the occasion of this present cause, both my purpose of prosecution against duels and the opinion of the court, without which I am nothing, for the censure of them may appear, and thereby offenders in that kind may read their own case, and know what they are to expect ; which may serve for a warning until example may be made in some greater person, which I doubt the times will but too soon afford.

Therefore, before I come to the particular, whereof your lordships are now to judge, I think the time best spent to speak somewhat (1) of the nature and greatness of this mischief ; (2) of the causes and remedies ; (3) of the justice of the law of England, which some stick not to think defective in this matter ; (4) of the capacity of this court, where certainly the remedy of this mischief is best to be found ; (5) touching mine own purpose and resolution, wherein I shall humbly crave your lordships' aid and assistance.

For the mischief itself, it may please your lordships to take into your consideration that, when revenge is once extorted out of the magistrates' hands, contrary to God's ordinance, *mihi vindicta, ego retribuam*, and every man shall bear the sword, not to defend, but to assail, and private men begin once to presume to give law to themselves and to right their own wrongs, no man can foresee the danger and inconveniences that may arise and multiply thereupon. It may cause sudden storms in court,

to the disturbance of his Majesty and unsafety of his person. It may grow from quarrels to bandying, and from bandying to trooping, and so to tumult and commotion ; from particular persons to dissension of families and alliances ; yea, to national quarrels, according to the infinite variety of accidents, which fall not under foresight. So that the State by this means shall be like to a distempered and imperfect body, continually subject to inflammations and convulsions. Besides, certainly both in divinity and in policy, offences of presumption are the greatest. Other offences yield and consent to the law that it is good, not daring to make defence, or to justify themselves ; but this offence expressly gives the law an affront, as if there were two laws, one a kind of gown law and the other a law of reputation, as they term it. So that Paul's and Westminster, the pulpit and the courts of justice, must give place to the law, as the King speaketh in his proclamation, of ordinary tables, and such reverend assemblies ; the Yearbooks, and statute books must give place to some French and Italian pamphlets, which handle the doctrines of duels, which, if they be in the right, *transeamus ad illa*, let us receive them, and not keep the people in conflict and distraction between two laws. Again, my lords, it is a miserable effect, when young men full of towardness and hope, such as the poets call "*Aurora filii*," sons of the morning, in whom the expectation and comfort of their friends consisteth, shall be cast away and destroyed in such a vain manner. But much more it is to be deplored when so much noble and genteel blood should be spilt upon such follies, as, if it were adventured in the field in service of the King and realm, were able to make the fortune of a day and change the future of a kingdom. So your lordships see what a desperate evil this is ; it troubleth peace ; it disfurnisheth war ; it bringeth calamity upon private men, peril upon the State, and contempt upon the law.

Touching the causes of it ; the first motive, no doubt, is a false and erroneous imagination of honour and credit ; and therefore the King, in his last proclamation, doth most aptly and excellently call them bewitching duels. For, if one judge of it truly, it is no better than a sorcery that enchanteth the spirits of young men, that bear great minds with a false show, *species falsa* ; and a kind of satanical illusion and apparition of honour against religion, against law, against moral virtue, and against the precedents and examples of the best times and valiantest nations ; as I shall tell you by and by, when I shall show you that the law of England is not alone in this point. But then the seed of this mischief being such, it is nourished by vain discourses and green and unripe conceits, which, nevertheless, have so prevailed as though a man were staid and sober-minded and a right believer touching the vanity

and unlawfulness of these duels ; yet the stream of vulgar opinion is such, as it imposeth a necessity upon men of value to conform themselves, or else there is no living or looking upon men's faces ; so that we have not to do, in this case, so much with particular persons as with unsound and depraved opinions, like the dominations and spirits of the air which the Scripture speaketh of. Hereunto may be added that men have almost lost the true notion and understanding of fortitude and valour. For fortitude distinguisheth of the grounds of quarrels whether they be just ; and not only so, but whether they be worthy ; and setteth a better price upon men's lives than to bestow them idly. Nay, it is weakness and disesteem of a man's self, to put a man's life upon such ledger performances. A man's life is not to be trifled away ; it is to be offered up and sacrificed to honourable services, public merits, good causes, and noble adventures. It is in expense of blood as it is in expense of money. It is no liberality to make a profusion of money upon every vain occasion ; nor no more is it fortitude to make effusion of blood, except the cause be of worth. And thus much for the cause of this evil.

For the remedies. I hope some great and noble person will put his hand to this plough, and I wish that my labours of this day may be but forerunners to the work of a higher and better hand. But yet to deliver my opinions as may be proper for this time and place, there be four things that I have thought on, as the most effectual for the repressing of this depraved custom of particular combats.

The first is, that there do appear and be declared a constant and settled resolution in the State to abolish it. For this is a thing, my lords, must go down at once or not at all ; for then every particular man will think himself acquitted in his reputation, when he sees that the State takes it to heart, as an insult against the King's power and authority, and thereupon hath absolutely resolved to master it ; like unto that which we set down in express words in the edict of Charles IX. of France, touching duels, that the King himself took upon him the honour of all that took themselves grieved or interested for not having performed the combat. So must the State do in this business ; and in my conscience there is none that is but of a reasonable sober disposition, be he never so valiant, except it be some furious person that is like a firework, but will be glad of it, when he shall see the law and rule of State disinterest him of a vain and unnecessary hazard.

Secondly, care must be taken that this evil be no more cockered, nor the humour of it fed ; wherein I humbly pray your lordships, that I may speak my mind freely, and yet be understood aright. The proceedings of the great and noble commissioners martial I honour and reverence much, and of them I speak not in any sort. But I say the

compounding of quarrels, which is otherwise in use by private noblemen and gentlemen, is so punctual, and hath such reference and respect unto the received conceits, what is beforehand, and what is behindhand, and I cannot tell what, as without all question it doth, in a fashion, countenance and authorize this practice of duels, as if it had in it somewhat of right.

Thirdly, I must acknowledge that I learned out of the King's last proclamation, the most prudent and best applied remedy for this offence, if it shall please his Majesty to use it, that the wit of man can devise. This offence, my lords, is grounded upon a false conceit of honour; and therefore it would be punished in the same kind, *in eo quis rectissime plectitur, in quo peccat*. The fountain of honour is the King and his aspect, and the access to his person continueth honour in life, and to be banished from his presence is one of the greatest eclipses of honour that can be. If his Majesty shall be pleased that when this court shall censure any of these offences in persons of eminent quality, to add this out of his own power and discipline, that these persons shall be banished and excluded from his court for certain years, and the courts of his queen and prince, I think there is no man that hath any good blood in him will commit an act that shall cast him into that darkness that he may not behold his sovereign's face.

Lastly, and that which more properly concerneth this court. We see, my lords, the root of this offence is stubborn; for it despiseth death, which is the utmost of punishments; and it were a just but a miserable severity to execute the law without all remission or mercy, where the case proveth capital. And yet the late severity in France was more, where by a kind of martial law, established by ordinance of the King and Parliament, the party that had slain another was presently had to the gibbet, insomuch as gentlemen of great quality were hanged, their wounds bleeding, lest a natural death should prevent the example of justice. But, my lords, the course which we shall take is of far greater lenity, and yet of no less efficacy; which is to punish, in this court, all the middle acts and proceedings which tend to the duel, which I will enumerate to you anon, and so to hew and vex the root in the branches, which, no doubt, in the end will kill the root, and yet prevent the extremity of law.

Now for the law of England, I see it excepted to, though ignorantly, in two points. The one, that it should make no difference between an insidious and foul murder, and the killing of a man upon fair terms, as they now call it. The other, that the law hath not provided sufficient punishment and reparations for contumely of words, as the lie, and the like. But these are no better than childish novelties against

the divine law, and against all laws in effect, and against the examples of all the bravest and most virtuous nations of the world.

For first, for the law of God, there is never to be found any difference made in homicide, but between homicide voluntary and involuntary, which we term misadventure. And for the case of misadventure itself, there were cities of refuge ; so that the offender was put to his flight, and that flight was subject to accident, whether the revenger of blood should overtake him before he had gained sanctuary or no. It is true that our law hath made a more subtle distinction between the will inflamed and the will advised, between manslaughter in heat and murder upon premeditated malice or cold blood, as the soldiers call it ; an indulgence not unfit for a choleric and warlike nation ; for it is true, *ira furor brevis*, a man in fury is not himself. This privilege of passion the ancient Roman law restrained, but to a case ; that was, if the husband took the adulterer in the manner. To that rage and provocation only it gave way, that a homicide was justifiable. But for a difference to be made in killing and destroying man, upon a forethought purpose, between foul and fair, and, as it were, between single murder and vied murder, it is but a monstrous child of this latter age, and there is no shadow of it in any law, divine or human. Only it is true, I find in the Scripture that Cain enticed his brother into the field and slew him treacherously ; but Lamech vaunted of his manhood, that he would kill a young man, and if it were to his hurt ; so I see no difference between an insidious murder and a braving or presumptuous murder, but the difference between Cain and Lamech.

As for example in civil states, all memory doth consent, that Græcia and Rome were the most valiant and generous nations of the world ; and that, which is more to be noted, they were free estates, and not under a monarchy ; whereby a man would think it a great deal the more reason that particular persons should have righted themselves. And yet they had not this practice of duels, nor anything that bare show thereof ; and sure they would have had it, if there had been any virtue in it. Nay, as he saith, "*Fas est et ab hoste doceri.*" It is memorable, that which is reported by a counsel or ambassador of the emperor, touching the censure of the Turks of these duels. There was a combat of this kind performed by two persons of quality of the Turks, wherein one of them was slain, and the other party was convened before the council of bashaws. The manner of the reprehension was in these words : "How durst you undertake to fight one with the other ? Are there not Christians enough to kill ? Did you not know that whether of you shall be slain, the loss would be the great seignor's ?" So, as we may

see, the most warlike nations, whether generous or barbarous, have ever despised this wherein now men glory.

It is true, my lords, that I find combats of two natures authorized, how justly I will not dispute as to the latter of them. The one, when upon the approaches of armies in the face one of the other, particular persons have made challenges for trial of valours in the field upon the public quarrel. This the Romans called "*pugna per provocationem*." And this was never, but either between the generals themselves, who were absolute, or between particulars by licence of the generals; never upon private authority. So you see David asked leave when he fought with Goliath; and Joab, when the armies were met, gave leave, and said "Let the young man play before us." And of this kind was that famous example in the wars of Naples, between twelve Spaniards and twelve Italians, where the Italians bore away the victory; besides other infinite like examples worthy and laudable, sometimes by singles, sometimes by numbers.

The second combat is a judicial trial of right, where the right is obscure, introduced by the Goths and the northern nations, but more anciently entertained in Spain. And this yet remains in some cases as a divine lot of battle, though controverted by divines, touching the lawfulness of it; so that a wise writer saith: "*Taliter pugnantes videntur tentare Deum, quia hoc volunt ut Deus ostendat et faciat miraculum, ut justam causam habens victor efficiatur, quod sæpe contra accidit*." But whatsoever it be, this kind of fight taketh its warrant from law. Nay, the French themselves, whence this folly seemeth chiefly to have flown, never had it but only in practice and toleration, and never as authorized by law; and yet now of late they have been fain to purge their folly with extreme rigour, in so much as many gentlemen left between death and life in the duels, as I spake before, were hastened to hanging with their wounds bleeding. For the State found it had been neglected so long, as nothing could be thought cruelty which tended to the putting of it down. As for the second defect, pretended in our law, that it hath provided no remedy for lies and fillips, it may receive like answer. It would have been thought a madness amongst the ancient lawgivers to have set a punishment upon the lie given, which in effect is but a word of denial, a negative of another's saying. Any lawgiver, if he had been asked the question, would have made Solon's answer: That he had not ordained any punishment for it, because he never imagined the world would have been so fantastical as to take it so highly. The civilians dispute whether an action of injury lie for it, and rather resolve the contrary. And Francis I. of France, who first set on and stamped this disgrace so deep, is taxed by the judgment of all wise

writers for beginning the vanity of it ; for it was he, that when he had himself given the lie and defy to the Emperor, to make it current in the world, said in a solemn assembly, " that he was no honest man that would bear the lie," which was the fountain of this new learning.

As for the words of reproach and contumely, whereof the lie was esteemed none, it is not credible, but that the orations themselves are extant, what extreme and exquisite reproaches were tossed up and down in the Senate of Rome and the places of assembly, and the like in Græcia, and yet no man took himself fouled by them, but took them but for breath, and the style of an enemy, and either despised them or returned them, but no blood was spilt about them.

So of every touch or light blow of the person, they are not in themselves considerable, save that they have got upon them the stamp of a disgrace, which maketh these light things pass for great matters. The law of England and all laws hold these degrees of injury to the person, slander, battery, mayhem, death ; and if there be extraordinary circumstances of despite and contumely, as in case of libels and bastinadoes and the like, this court taketh them in hand and punisheth them exemplarily. But for this apprehension of a disgrace that a fillip to the person should be a mortal wound to the reputation, it were good that men did hearken unto the saying of Gonsalvo, the great and famous commander, that was wont to say a gentleman's honour should be *de tela crassiore*, of a good strong warp or web, that every little thing should not catch in it ; when as now it seems they are but of cobweb-lawn or such light stuff, which certainly is weakness, and not true greatness of mind, but like a sick man's body, that is so tender that it feels everything. And so much in maintenance and demonstration of the wisdom and justice of the law of the land.

SIR ROBERT BALL

(1840-1913).

THE famous astronomer was the son of Robert Ball, LL.D., who was himself a naturalist of repute. He was born in July, 1840, in Dublin, and educated at Trinity College. He was appointed assistant to the Earl of Rosse's observatory at Parsonstown and while here he discovered four spiral nebulae. On the death of Lord Rosse he succeeded to the professorship of mathematics in Dublin University, and in 1874 became Royal Astronomer of Ireland, a post he held until 1898. In 1892, Ball had been elected Lowndean Professor of Astronomy and Geometry at Cambridge and also Director of the Observatory. From 1897-9 he was president of the Royal Astronomical Society. He had been knighted in 1886.

Of his books the best are "The Story of the Heavens," "Great Astronomers," and a "Popular Guide to the Heavens." His more learned works include a "Treatise on Spherical Astronomy," 1885, and a "Treatise on the Theory of Screws," 1900. He died at Cambridge on the 25th of November, 1913.

THE MOON

(Lecture delivered in Dublin).

IF the moon were suddenly struck out of existence, we should be immediately apprised of the fact by a wail from every seaport in the kingdom. From London and from Liverpool we should hear the same story—the rise and fall of the tide had almost ceased. The ships in dock could not get out; the ships outside could not get in; and the maritime commerce of the world would be thrown into dire confusion.

The moon is the principal agent in causing the daily ebb and flow of the tide, and this is the most important work which our satellite has to do. The fleets of fishing boats around the coasts time their daily movements by the tide, and are largely indebted to the moon for bringing them in and out of harbour. Experienced sailors assure us that the tides

are of the utmost service to navigation. The question as to how the moon causes the tides is postponed to a future lecture, in which we shall also sketch the marvellous part which the tides seemed to have played in the early history of our earth.

Who is there that has not watched, with admiration, the beautiful series of changes through which the moon passes every month? We first see her as an exquisite crescent of pale light in the western sky after sunset. If the night is fine, the rest of the moon is visible inside the crescent, being faintly illumined by light reflected from our own earth. Night after night she moves further and further to the east, until she becomes full, and rises about the same time that the sun sets. From the time of the full the disc of light begins to diminish until the last quarter is reached. Then it is that the moon is seen high in the heavens in the morning. As the days pass by, the crescent shape is again assumed. The crescent wanes thinner and thinner as the satellite draws closer to the sun. Finally she becomes lost in the over-powering light of the sun, again to emerge as the new moon, and again to go through the same cycle of changes.

The brilliance of the moon arises solely from the light of the sun which falls on the not self-luminous substance of the moon. Out of the vast flood of light which the sun pours forth with such prodigality into space the dark body of the moon intercepts a little, and of that little it reflects a small fraction to illuminate the earth. The moon sheds so much light, and seems so bright, that it is often difficult at night to remember that the moon has no light except what falls on it from the sun. Nevertheless, the actual surface of the brightest full moon is perhaps not much brighter than the streets of London on a clear sunshiny day. A very simple observation will suffice to show that the moon's light is only sunlight. Look some morning at the moon in daylight, and compare the moon with the clouds. The brightness of the moon and of the clouds are directly comparable, and then it can be readily comprehended how the sun which illuminates the clouds has also illumined the moon. An attempt has been made to form a comparative estimate of the brightness of the sun and the full moon. If 600,000 full moons were shining at once, their collective brilliancy would equal that of the sun.

The beautiful crescent moon has furnished a theme for many a poet. Indeed, if we may venture to say so, it would seem that some poets have forgotten that the moon is not to be seen every night. A poetical description of evening is almost certain to be associated with the appearance of the moon in some phase or other. We may cite one notable instance in which a poet, describing an historical event, has

enshrined in exquisite verse a statement which cannot be correct. Every child who speaks our language has been taught that the burial of Sir John Moore took place :

“ By the struggling moonbeams’ misty light.”

There is an appearance of detail in this statement which wears the garb of truth. We are not inclined to doubt that the night was misty, nor as to whether the moonbeams had to struggle into visibility ; the question at issue is a much more fundamental one. We do not know who was the first to raise the point as to whether any moon shone on that memorable event at all or not ; but the question having been raised, the Nautical Almanac immediately supplies an answer. From it we learn in language, whose truthfulness constitutes its only claim to be poetry, that the moon was new at one o’clock in the morning of the day of the battle of Corunna (January 16, 1809). The ballad evidently implies that the funeral took place on the night following the battle. We are therefore assured that the moon can hardly have been a day old when the hero was consigned to his grave. But the moon in such a case is practically invisible, and yields no appreciable moonbeams at all, misty or otherwise. Indeed, if the funeral took place at the “ dead of night,” as the poet asserts, then the moon must have been far below the horizon at the time.

In alluding to this and similar instances, Mr. Nasmyth gives a word of advice to authors or to artists who desire to bring the moon on a scene without knowing as a matter of fact that our satellite was actually present. He recommends them to follow the example of Bottom in “ A Midsummer Night’s Dream,” and consult “ a calendar, a calendar ! Look in the almanac ; find out moonshine, find out moonshine ! ”

Among the countless host of celestial bodies—the sun, the moon, the planets, and the stars—our satellite enjoys one special claim on our attention. The moon is our nearest permanent neighbour. It is just possible that a comet may occasionally approach the earth more closely than the moon, but with this exception the other celestial bodies are generally hundreds of thousands, or even many millions, of times further from us than the moon.

It is also to be observed that the moon is one of the smallest visible objects which the heavens contain. Every one of the thousands of stars that can be seen with the unaided eye is enormously larger than our satellite. The brilliance and apparent vast proportions of the moon arise from the fact that it is only 239,000 miles away, which is a distance almost immeasurably small when compared with the distances between the earth and the stars.

During a long voyage, and perhaps in critical circumstances, the moon will often render invaluable information to the sailor. To navigate a ship, suppose from Liverpool to China, the captain must frequently determine the precise position which his ship then occupies. If he could not do this, he would never find his way across the trackless ocean. Observations of the sun give him his latitude and tell him his local time, but the captain further requires to know the Greenwich time before he can place his finger at a point of the chart and say, "My ship is here." To ascertain the Greenwich time the ship carries a chronometer which has been carefully rated before starting, and, as a precaution, two or three chronometers are usually provided to guard against the risk of error. An unknown error of a minute in the chronometer might perhaps lead the vessel fifteen miles from its proper course.

It is important to have the means of testing the chronometers during the progress of the voyage ; and it would be a great convenience if every captain, when he wished, could actually consult some infallible standard of Greenwich time. We want, in fact, a Greenwich clock which may be visible over the whole globe. There is such a clock ; and, like any other clock, it has a face on which certain marks are made, and a hand which travels round that face. The great clock at Westminster shrinks into significance when compared with the mighty clock which the captain uses for setting his chronometer. The face of this stupendous dial is the face of the heavens. The numbers engraved on the face of a clock are replaced by the twinkling stars ; while the hand which moves over the dial is the beautiful moon herself. When the captain desires to test his chronometer, he measures the distance of the moon from a neighbouring star. In the Nautical Almanac he finds the Greenwich time at which the moon was three degrees from the star. Comparing this with the indications of the chronometer, he finds the required correction. In recent years ships carry more chronometers, so the lunar method has fallen into disuse.

There is one widely-credited myth about the moon which must be regarded as devoid of foundation. The idea that our satellite and the weather bear some relation has no doubt been entertained by high authority, and appears to be an article in the belief of many an excellent mariner. Careful comparison between the state of the weather and the phases of the moon has, however, quite discredited the notion that any connexion of the kind does really exist.

The lunar landscapes are excessively weird and rugged. They always remind us of sterile deserts, and we cannot fail to notice the absence of grassy plains or green forests such as we are familiar with on

our globe. In some respects the moon is not very differently circumstanced from the earth. Like it, the moon has the pleasing alternations of day and night, though the day in the moon is as long as twenty-nine of our days, and the night of the moon is as long as twenty-nine of our nights. We are warmed by the rays of the sun ; so, too, is the moon ; but, whatever may be the temperature during the long day on the moon, it seems certain that the cold of the lunar night would transcend that known in the bleakest regions of our earth. The amount of heat radiated to us by the moon has been investigated by Lord Rosse, and more recently by Professor Langley. Though every point on the moon's surface is exposed to the sunlight for a fortnight, without any interruption, the actual temperature to which the soil is raised cannot be a high one. The moon does not, like the earth, possess a warm blanket, in the shape of an atmosphere, which can keep in and accumulate the heat received.

Even our largest telescopes can tell nothing directly as to whether life can exist on the moon. The mammoth trees of California might be growing on the lunar mountains, and elephants might be walking about on the plains, but our telescopes could not show them. The smallest object that we can see on the moon must be about as large as a good-sized cathedral, so that organized beings resembling in size any that we are familiar with, if they existed, could not make themselves visible as telescopic objects.

We are therefore compelled to resort to indirect evidence as to whether life would be possible on the moon. We may say at once that astronomers believe that life, as we know it, could not exist. Among the necessary conditions of life, water is one of the first. Take every form of vegetable life, from the lichen which grows on the rock to the giant tree of the forest, and we find the substance of every plant contains water, and could not exist without it. Nor is water less necessary to the existence of animal life. Deprived of this element, all organic life, the life of man himself, would be inconceivable.

Unless, therefore, water be present in the moon, we shall be bound to conclude that life, as we know it, is impossible. If anyone stationed on the moon were to look at the earth through a telescope, would he be able to see any water here ? Most undoubtedly he would. He would see the clouds and he would notice their incessant changes, and the clouds alone would be almost conclusive evidence of the existence of water. An astronomer on the moon would also see our oceans as coloured surfaces, remarkably contrasted with the land, and he would perhaps frequently see an image of the sun, like a brilliant star, reflected from some smooth portion of the sea. In fact, considering that much

more than half of our globe is covered with oceans, and that most of the remainder is liable to be obscured by clouds, the lunar astronomer in looking at our earth would often see hardly anything but water in one form or another. Very likely he would come to the conclusion that our globe was fitted to be a residence for only amphibious animals.

But when we look at the moon with our telescopes we see no direct evidence of water. Close inspection shows that the so-called lunar seas are deserts, often marked with small craters and rocks. The telescope reveals no seas and no oceans, no lakes and no rivers. Nor is the grandeur of the moon's scenery ever impaired by clouds over her surface. Whenever the moon is above our horizon, and terrestrial clouds are out of the way, we can see the features of our satellite's surface with distinctness. There are no clouds in the moon; there are not even the mists or the vapours which invariably arise wherever water is present, and therefore astronomers have been led to the conclusion that the surface of the globe which attends the earth is a sterile and a waterless desert.

Another essential element of organic life is also absent from the moon. Our globe is surrounded with a deep clothing of air resting on the surface, and extending above our heads to the height of about 200 or 300 miles. We need hardly say how necessary air is to life, and therefore we turn with interest to the question as to whether the moon can be surrounded with an atmosphere. Let us clearly understand the problem we are about to consider. Imagine that a traveller started from the earth on a journey to the moon; as he proceeded, the air would gradually become more and more rarefied, until at length, when he was a few hundred miles above the earth's surface, he would have left the last perceptible traces of the earth's envelope behind him. By the time he had passed completely through the atmosphere he would have advanced only a very small fraction of the whole journey of 239,000 miles, and there would still remain a vast void to be traversed before the moon would be reached. If the moon were enveloped in the same way as the earth, then, as the traveller approached the end of his journey, and came within a few hundred miles of the moon's surface, he would meet again with traces of an atmosphere, which would gradually increase in density until he arrived at the moon's surface. The traveller would thus have passed through one stratum of air at the beginning of his journey, and through another at the end, while the main portion of the voyage would have been through space more void than that to be found in the exhausted receiver of an air-pump.

Such would be the case if the moon were coated with an atmosphere like that surrounding our earth. But what are the facts? The traveller

as he drew near the moon would seek in vain for air to breathe at all resembling ours. It is possible that close to the surface there are faint traces of some gaseous material surrounding the moon, but it can only be equal to a very small fractional part of the ample clothing which the earth now enjoys. For all purposes of respiration, as we understand the term, we may say that there is no air on the moon, and an inhabitant of our earth transferred thereto would be as certainly suffocated as he would be in the middle of space.

The absence of air and of water from the moon explains the sublime ruggedness of the lunar scenery. We know that on the earth the action of wind and of rain, of frost and of snow, is constantly tending to wear down our mountains and reduce their asperities. No such agents are at work on the moon. Volcanoes sculptured the surface into its present condition, and, though they have ceased to operate for ages, the traces of their handiwork seem nearly as fresh to-day as they were when the mighty fires were extinguished.

"The cloud-capped towers, the gorgeous palaces, the solemn temples," have but a brief career on earth. It is chiefly the incessant action of water and of air that makes them vanish like the "baseless fabric of a vision." On the moon these causes of disintegration and of decay are all absent, though perhaps the changes of temperature in the transition from lunar day to lunar night would be attended with expansions and contractions that might compensate in some slight degree for the absence of more potent agents of dissolution.

It seems probable that a building on the moon would remain for century after century just as it was left by the builders. There need be no glass in the windows, for there is no wind and no rain to keep out. There need not be fireplaces in the rooms, for fuel cannot burn without air. Dwellers in a lunar city would find that no dust could rise, no odours be perceived, no sounds be heard.

Man is a creature adapted for life under circumstances which are very narrowly limited. A few degrees of temperature more or less, a slight variation in the composition of air, the precise suitability of food, make all the difference between health and sickness, between life and death. Looking beyond the moon, into the length and breadth of the universe, we find countless celestial globes with every conceivable variety of temperature and of constitution. Amid this vast number of worlds with which space is tenanted, are there any inhabited by living beings? To this great question science can make no response: we cannot tell. Yet it is impossible to resist a conjecture. We find our earth teeming with life in every part. We find life under the most varied conditions that can be conceived. It is met with under the

burning heat of the tropics and in the everlasting frosts at the poles. We find life in caves where not a ray of light ever penetrates. Nor is it wanting in the depths of the ocean, at the pressure of tons on the square inch. Whatever may be the external circumstances, Nature generally provides some form of life to which those circumstances are congenial.

It is not at all probable that among the million spheres of the universe there is a single one exactly like our earth—like it in the possession of air and of water, like it in size and in composition. It does not seem probable that a man could live for one hour on any body in the universe except the earth, or that an oak-tree could live in any other sphere for a single season. Men can dwell on the earth, and oak-trees can thrive therein, because the constitutions of the man and of the oak are specially adapted to the particular circumstances of the earth.

Could we obtain a closer view of some of the celestial bodies, we should probably find that they, too, teem with life, but with life specially adapted to the environment—life in forms strange and weird ; life far stranger to us than Columbus found it to be in the New World when he first landed there. Life, it may be, stranger than ever Dante described or Doré sketched. Intelligence may also have a home among those spheres no less than on the earth. There are globes greater and globes less—atmospheres greater and atmospheres less. The truest philosophy on this subject is crystallized in the language of Tennyson :

“ This truth within thy mind rehearse,
That in a boundless universe
Is boundless better, boundless worse.

“ Think you this mould of hopes and fears
Could find no statelier than his peers
In yonder hundred million spheres ? ”

LORD BEACONSFIELD

(BENJAMIN DISRAELI)

(1804-1881).

WHEN, at the age of thirty-three, Benjamin Disraeli entered the House of Commons, he was flushed with his first literary successes and inclined perhaps to take parliamentary popularity by storm. It was the first year of the Victorian reign (1837) and the fashions of the times allowed great latitude for the display of idiosyncracies in dress. It seems that Disraeli pushed this advantage to the point of licence. We hear much of the amount of jewellery he wore and of the gaudiness of his waistcoats. This may or may not have had a deciding influence in determining the character of his reception by the House, but at any rate it was a tempestuous one. He was repeatedly interrupted, and when he attempted to proceed the uproar of cries and laughter finally overpowered him and he abandoned for the time being the attempt to speak—not, however, until he had served on the House due notice of his great future, expressed in the memorable words—thundered, we are told, at the top of his voice, and audible still in English history—"You *shall* hear me!"

Not ten years later, the young man with the gaudy waistcoats had become the leading Conservative orator of the campaign against the Liberals on their Corn Law policy and so great was the impression produced by his speeches that in 1852, when the Derby ministry was formed, he was made Chancellor of the Exchequer.

The secret of his success is the thorough-going way in which he identified himself with the English aristocracy. Where others had apologized for aristocracy as a method of government, he justified. Instead of excusing and avoiding, he assumed that a government of privilege rather than that based on rights or the assumption of their existence is the best possible government, the only natural one, the only one capable of perpetuating itself without constant and violent changes. Kept on the defensive by the forward movement of the people, as well as by the tendency towards Liberalism or Radicalism shown by the men of highest education among the aristocratic classes themselves, the English Conservatives were delighted to find a man of great ability and striking eloquence, who seemed to have a religious

conviction that "Toryism" was the only means of saving society and ensuring progress. It is characteristic of his mind and his methods, that he does not shrink from calling himself a Tory. He is as proud of bearing that reproach as Camille Desmoulins was of being called a Sansculotte. When a man is thus "for thorough," he becomes representative of all who have his aspirations or share his tendencies without his aggressiveness. No doubt Disraeli's speeches are the best embodiment of Tory principle, the most attractive presentation of aristocratic purposes in government made in the nineteenth century. No member of the English peerage to the "manner born" has approached him in this respect. It is not a question of whether others have equalled or exceeded him in ability or statesmanship. On that point there may be room for difference of opinion, but to read any one of his great speeches is to see at once that he has the infinite advantage of the rest in being the strenuous and faith-inspired champion of aristocracy and government by privilege—not the mere defender and apologist for it.

In the extent of his information, the energy and versatility of his intellect, and the boldness of his methods, he had no equal among the Conservative leaders of the Victorian reign. His audacity was well illustrated when, after the great struggle over the reform measures of 1866 which he opposed, the Conservatives succeeded to power, and he, as their representative, advanced a measure "more sweeping in its nature as a reform bill than that he had successfully opposed" when it was advocated by Gladstone. In foreign affairs, he showed the same boldness, working to check the Liberal advance at home by directing public attention away from domestic grievances to brilliant achievements abroad. This policy which his opponents resented the more bitterly because they saw it to be the only one by which they could be held in check, won him the title of "Jingo," and made him the leading representative of British imperialism abroad as he was of English aristocracy at home.

AGAINST DEMOCRACY FOR ENGLAND

(Delivered in 1865).

SIR, I could have wished, and once I almost believed, that it was not necessary for me to take part in this debate. I look on this discussion as the natural epilogue of the Parliament of 1859; we remember the prologue. I consider this to be a controversy between the educational section of the Liberal party and that section of the Liberal

party, according to their companions and colleagues, not entitled to an epithet so euphuistic and complimentary. But after the speech of the minister, I hardly think it would become me, representing the opinions of the gentlemen with whom I am acting on this side of the House, entirely to be silent. We have a measure before us to-night which is to increase the franchise in boroughs. Without reference to any other circumstances I object to that measure. I object to it because an increase of the franchise in boroughs is a proposal to redistribute political power in the country. I do not think political power in the country ought to be treated partially; from the very nature of things it is impossible, if there is to be a redistribution of political power, that you can only regard the suffrage as it affects one section of the constituent body. Whatever the proposition of the honourable gentleman, whether abstractedly it may be expedient or not, this is quite clear, that it must be considered not only in relation to the particular persons with whom it will deal, but to other persons with whom it does not deal, though it would affect them. And therefore it has always been quite clear that if you deal with the subject popularly called Parliamentary Reform, you must deal with it comprehensively. The arrangements you may make with reference to one part of the community may not be objectionable in themselves, but may be extremely objectionable if you consider them with reference to other parts. Consequently it has been held—and the more we consider the subject the more true and just appears to be the conclusion—that if you deal with the matter you must deal with it comprehensively. You must not only consider borough constituencies, you must consider county constituencies: and when persons rise up and urge their claims to be introduced into the constituent body, even if you think there is a plausible claim substantiated on their part, you are bound in policy and justice to consider also the claims of other bodies not in possession of the franchise, but whose right to consideration may be equally great. And so clear is it when you come to the distribution of power that you must consider the subject in all its bearings, that even honourable gentlemen who have taken part in this debate have not been able to avoid the question of what they call the redistribution of seats—a very important part of the distribution of power. It is easy for the honourable member for Liskeard, for example, to rise and say, in supporting this measure for the increase of the borough franchise, that it is impossible any longer to conceal the anomalies of our system in regard to the distribution of seats. “Is it not monstrous,” he asks, “that Calne, with 173 voters, should return a member, while Glasgow returns only two, with a constituency of 20,000?” Well, it may be equally monstrous that Liskeard should return one member, and that Birkenhead should

only make a similar return. The distribution of seats, as any one must know who has ever considered the subject deeply and with a sense of responsibility towards the country, is one of the most profound and difficult questions that can be brought before the House. It is all very well to treat it in an easy, off-hand manner ; but how are you to reconcile the case of North Cheshire, of North Durham, of West Kent, and many other counties, where you find four or six great towns, with a population, perhaps, of 100,000, returning six members to this House, while the rest of the population of the county, though equal in amount, returns only two members ? How are you to meet the case of the representation of South Lancashire in reference to its boroughs ? Why, those are more anomalous than the case of Calne.

Then there is the question of Scotland. With a population hardly equal to that of the metropolis, and with wealth greatly inferior—probably not more than two-thirds of the amount—Scotland yet possesses forty-eight members, while the metropolis has only twenty. Do you Reformers mean to say that you are prepared to disfranchise Scotland ; or that you are going to develop the representation of the metropolis in proportion to its population and property ; and so allow a country like England, so devoted to local government and so influenced by local feeling, to be governed by London ? And, therefore, when those speeches are made which gain a cheer for the moment, and are supposed to be so unanswerable as arguments in favour of parliamentary change, I would recommend the House to recollect that this, as a question, is one of the most difficult and one of the deepest that can possibly engage the attention of the country. The fact is this—in the representation of this country you do not depend on population or on property merely, or on both conjoined ; you have to see that there is something besides population and property—you have to take care that the country itself is represented. That is one reason why I am opposed to the second reading of the bill. There is another objection which I have to this bill brought forward by the honourable member for Leeds, and that is, that it is brought forward by the member for Leeds. I do not consider this a subject which ought to be intrusted to the care and guidance of any independent member of this House. If there be one subject more than another that deserves the consideration and demands the responsibility of the Government, it certainly is the reconstruction of our parliamentary system ; and it is the government or the political party candidates for power, who recommend a policy, and who will not shrink from the responsibility of carrying that policy into effect if the opportunity be afforded to them, who alone are qualified to deal with a question of this importance. But sir, I shall be told, as we have been told in a previous portion of the

adjourned debate, that the two great parties of the State cannot be trusted to deal with this question, because they have both trifled with it. That is a charge which has been made repeatedly during this discussion and on previous occasions, and certainly a graver one could not be made in this House. I am not prepared to admit that even our opponents have trifled with this question. We have had a very animated account by the right honourable gentleman who has just addressed us as to what may be called the Story of the Reform Measures. It was animated, but it was not accurate. Mine will be accurate, though I fear it will not be animated. I am not prepared to believe that English statesmen, though they be opposed to me in politics, and may sit on opposite benches, could ever have intended to trifle with this question. I think that possibly they may have made great mistakes in the course which they took ; they may have miscalculated, they may have been misled ; but I do not believe that any men in this country, occupying the posts, the eminent posts, of those who have recommended any reconstruction of our parliamentary system in modern days, could have advised a course which they disapproved. They may have thought it perilous, they may have thought it difficult, but though they may have been misled I am convinced they must have felt that it was necessary. Let me say a word in favour of one with whom I have had no political connection, and to whom I have been placed in constant opposition in this House when he was an honoured member of it—I mean Lord Russell. I cannot at all agree with the lively narrative of the right honourable gentleman, according to which Parliamentary Reform was but the creature of Lord John Russell, whose cabinet, controlled by him with the vigour of a Richelieu, at all times disapproved his course ; still less can I acknowledge that merely to amuse himself, or in a moment of difficulty to excite some popular sympathy, Lord John Russell was a statesman always with Reform in his pocket, ready to produce it and make a display. How different from that astute and sagacious statesman now at the head of her Majesty's government, whom I almost hoped to have seen in his place this evening. I am sure it would have given the House great pleasure to have seen him here, and the House itself would have assumed a more good-humoured appearance. I certainly did hope that the noble lord would have been enabled to be in his place and prepared to support his policy. According to the animated but not quite accurate account of the right honourable gentleman who has just sat down, all that Lord Derby did was to sanction the humour and caprice of Lord John Russell. It is true that Lord John Russell when prime minister recommended that her Majesty in the speech from the throne should call the attention of Parliament to the expediency of noticing the condition of our representative system ; but Lord John

Russell unfortunately shortly afterwards retired from his eminent position.

He was succeeded by one of the most considerable statesmen of our days, a statesman not connected with the political school of Lord John Russell, who was called to power not only with the assistance of Lord John Russell and the leading members of the Whig party, but supported by the whole class of eminent statesmen who had been educated in the same school and under the same distinguished master. This eminent statesman, however, is entirely forgotten. The right honourable gentleman overlooks the fact that Lord Aberdeen, when prime minister, and when all the principal places in his cabinet were filled with the disciples of Sir Robert Peel, did think it his duty to recommend the same counsel to her Majesty. But this is an important, and not the only important, item in the history of the Reform Bill which has been ignored by the right honourable gentleman. The time, however, came when Lord Aberdeen gave place to another statesman, who has been complimented on his sagacity in evading the subject, as if such a course would be a subject for congratulation. Let me vindicate the policy of Lord Palmerston in his absence. He did not evade the question. Lord Palmerston followed the example of Lord John Russell. He followed the example also of Lord Aberdeen, and recommended her Majesty to notice the subject in the speech from the throne. What becomes, then, of the lively narrative of the right honourable gentleman, and what becomes of the inference and conclusions which he drew from it? Not only is his account inaccurate, but it is injurious, as I take it, to the course of sound policy and the honour of public men. Well, now you have three prime ministers bringing forward the question of Parliamentary Reform; you have Lord John Russell, Lord Aberdeen, and you have even that statesman who, according to the account of the right honourable gentleman, was so eminent for his sagacity in evading the subject altogether. Now, let me ask the House to consider the position of Lord Derby when he was called to power, a position which you cannot rightly understand if you accept as correct the fallacious statements of the right honourable gentleman. I will give the House an account of this subject, the accuracy of which I believe neither side will impugn. It may not possibly be without interest, and will not, I am sure be without significance. Lord Derby was sent for by her Majesty—an unwilling candidate for office, for let me remind the House that at that moment there was an adverse majority of 140 in the House of Commons, and I therefore do not think that Lord Derby was open to any imputation in hesitating to accept political responsibility under such circumstances. Lord Derby laid these considerations before her Majesty. I speak, of course, with

reserve. I say nothing now which I have not said before on the discussion of political subjects in this House. But when a government comes in on Reform and remains in power six years without passing any measure of the kind, it is possible that these circumstances, too, may be lost sight of. Lord Derby advised her Majesty not to form a government under his influence, because there existed so large a majority against him in the House of Commons, and because this question of Reform was placed in such a position that it was impossible to deal with it as he should wish. But it should be remembered that Lord Derby was a member of the famous Cabinet which carried the Reform Bill in 1832. Lord Derby, as Lord Stanley, was in the House of Commons one of the most efficient promoters of the measure. Lord Derby believed that the bill had tended to effect the purpose for which it was designed, and although no man superior to prejudices could fail to see that some who were entitled to the exercise of the franchise were still debarred from the privilege, yet he could not also fail to perceive the danger which would arise from our tampering with the franchise. On these grounds Lord Derby declined the honour which her Majesty desired to confer upon him, but the appeal was repeated. Under these circumstances it would have been impossible for any English statesman longer to hesitate ; but I am bound to say that there was no other contract or understanding further than that which prevails among men, however different their politics, who love their country and wish to maintain its greatness. I am bound to add that there was an understanding at the time existing among men of weight on both sides of the House that the position in which the Reform question was placed was one embarrassing to the Crown and not creditable to the House, and that any minister trying his best to deal with it under these circumstances would receive the candid consideration of the House. It was thought, moreover, that a time might possibly arrive when both parties would unite in endeavouring to bring about a solution which would tend to the advantage and benefit of the country. And yet, says the right honourable gentleman, it was only in 1860 that the portentous truth flashed across the mind of the country—only in 1860, after so many ministers had been dealing with the question for so many years. All I can say is that this was the question, and the only question, which engaged the attention of Lord Derby's cabinet. The question was whether they could secure the franchise for a certain portion of the working classes, who, by their industry, their intelligence, and their integrity, showed that they were worthy of such a possession, without at the same time overwhelming the rest of the constituency by the numbers of those whom they admitted. That, sir, was the only question which occupied the attention of the government of Lord Derby,

and yet the right honourable gentleman says that it was in 1860 that the attention of the public was first called to the subject, when, in fact, the question of Parliamentary Reform had been before them for ten years, and on a greater scale than that embraced by the measure under consideration this evening.

I need not remind the House of the reception which Lord Derby's Bill encountered. It is neither my disposition, nor, I am sure, that of any of my colleagues, to complain of the votes of this House on that occasion. Political life must be taken as you find it, and as far as I am concerned not a word shall escape me on the subject. But from the speeches made the first night, and from the speech made by the right honourable gentleman this evening, I believe I am right in vindicating the conduct pursued by the party with which I act. I believe that the measure which we brought forward was the only one which has tended to meet the difficulties which beset this question. Totally irrespective of other modes of dealing with the question, there were two franchises especially proposed on this occasion, which, in my mind, would have done much towards solving the difficulty. The first was the franchise founded upon personal property, and the second the franchise founded upon partial occupation. Those two franchises, irrespective of other modes by which we attempted to meet the want and the difficulty—these two franchises, had they been brought into committee of this House, would, in my opinion, have been so shaped and adapted that they would have effected those objects which the majority of the House desire. We endeavoured in that bill to make proposals which were in the genius of the English constitution. We did not consider the constitution a mere phrase. We knew that the constitution of this country is a monarchy tempered by co-ordinate estates of the realm. We knew that the House of Commons is an estate of the realm ; we knew that the estates of the realm form a political body, invested with political power for the government of the country and for the public good ; yet we thought that it was a body founded upon privilege and not upon right. It is, therefore, in the noblest and properest sense of the word, an aristocratic body, and from that characteristic the Reform Bill of 1832 did not derogate ; and if at this moment we could contrive, as we did in 1859, to add considerably to the number of the constituent body, we should not change that characteristic, but it would still remain founded upon an aristocratic principle. Well, now the Secretary of State (Sir G. Grey) has addressed us to-night in a very remarkable speech. He also takes up the history of Reform, and before I touch upon some of the features of that speech it is my duty to refer to the statements which he made with regard to the policy which the government of Lord Derby was prepared to assume after the general

election. By a total misrepresentation of the character of the amendment proposed by Lord John Russell, which threw the government of 1858 into a minority, and by quoting a passage from a very long speech of mine in 1859, the right honourable gentleman most dexterously conveyed these two propositions to the House—first, that Lord John Russell had proposed an amendment to our Reform Bill, by which the House declared that no bill could be satisfactory by which the working classes were not admitted to the franchise—one of our main objects being that the working classes should in a great measure be admitted to the franchise; and, secondly, that after the election I was prepared, as the organ of the government, to give up all the schemes for those franchises founded upon personal property, partial occupation, and other grounds, and to substitute a bill lowering the borough qualification. That conveyed to the House a totally inaccurate idea of the amendment of Lord John Russell. There was not a single word in that amendment about the working classes. There was not a single phrase upon which that issue was raised, nor could it have been raised, because our bill, whether it could have effected the object or not, was a bill which proposed greatly to enfranchise the working classes. And as regards the statement I made, it simply was this. The election was over—we were still menaced, but we, still acting according to our sense of duty, recommended in the royal speech that the question of a reform of Parliament should be dealt with; because I must be allowed to remind the House that whatever may have been our errors, we proposed a bill which we intended to carry. And having once taken up the question as a matter of duty, no doubt greatly influenced by what we considered the unhappy mistakes of our predecessors, and the difficult position in which they had placed Parliament and the country, we determined not to leave the question until it had been settled. But although still menaced, we felt it to be our duty to recommend to her Majesty to introduce the question of Reform when the Parliament of 1859 met; and how were we, except in that spirit of compromise which is the principal characteristic of our political system, how could we introduce a Reform Bill after that election, without in some degree considering the possibility of lowering the borough franchise? But it was not a franchise of £6, but it was an arrangement that was to be taken with the rest of the bill, and if it had been met in the same spirit we might have retained our places. But, says the right honourable gentleman, pursuing his history of the Reform question, when the government of Lord Derby retired from office “we came in, and we were perfectly sincere in our intentions to carry a Reform Bill; but we experienced such opposition, and never was there such opposition. There was the

right honourable gentleman," meaning myself, "he absolutely allowed our bill to be read a second time."

That tremendous reckless opposition to the right honourable gentleman which allowed the bill to be read a second time, seems to have laid the government prostrate. If he had succeeded in throwing out the bill, the right honourable gentleman and his friends would have been relieved from great embarrassment. But the bill having been read a second time, the government were quite overcome, and it appears they never have recovered from the paralysis up to this time. The right honourable gentleman was good enough to say that the proposition of his government was rather coldly received upon his side of the House, but he said "nobody spoke against it." Nobody spoke against the bill on this side, but I remember some most remarkable speeches from the right honourable gentleman's friends. There was the great city of Edinburgh, represented by acute eloquence of which we never weary, and which again upon the present occasion we have heard; there was the great city of Bristol, represented on that occasion among the opponents, and many other constituencies of equal importance. But the most remarkable speech, which "killed cock robin" was absolutely delivered by one who might be described as almost a member of the government—the Chairman of Ways and Means (Mr. Massey), who, I believe, spoke from immediately behind the Prime Minister. Did the government express any disapprobation of such conduct? They have promoted him to a great post, and have sent him to India with an income of fabulous amount. And now they are astonished they cannot carry a Reform Bill. If they removed all those among their supporters who oppose such bills by preferring them to posts of great confidence and great lucre, how can they suppose that they will ever carry one? Looking at the policy of the government, I am not at all astonished at the speech which the right honourable gentleman, the Secretary of State, has made this evening. Of which speech I may observe, that although it was remarkable for many things, yet there were two conclusions at which the right honourable gentleman arrived. First, the repudiation of the rights of man, and, next, the repudiation of the £6 franchise. The first is a great relief, and, remembering what the feeling of the House was only a year ago, when by the dangerous but fascinating eloquence of the Chancellor of the Exchequer, we were led to believe that the days of Tom Paine had returned, and that Rousseau was to be rivalled by a new social contract, it must be a great relief to every respectable man here to find that not only are we not to have the rights of man, but we are not even to have the 1862 franchise. It is a matter, I think, of great congratulation, and I am ready to give credit to the Secretary of State for the honesty with which he has ex-

pressed himself, and I only wish we had had the same frankness, the same honesty we always have, arising from a clear view of his subject, in the first year of the Parliament as we have had in the last. I will follow the example of the right honourable gentleman and his friends. I have not changed my opinions upon the subject of what is called Parliamentary Reform. All that has occurred, all that I have observed, all the results of my reflections, lead me to this more and more—that the principle upon which the constituencies of this country should be increased is one not of radical, but I may say of lateral reform—the extension of the franchise, not its degradation. And although I do not wish in any way to deny that we were in the most difficult position when the Parliament of 1859 met, being anxious to assist the Crown and the Parliament by proposing some moderate measure which men on both sides might support, we did, to a certain extent, agree to some modification of the £10 franchise—to what extent no one knows; but I may say that it would have been one which would not at all have affected the character of the franchise, such as I and my colleagues wished to maintain. Yet I confess that my opinion is opposed, as it originally was, to any course of the kind. I think that it would fail in its object, that it would not secure the introduction of that particular class which we all desire to introduce, but that it would introduce many others who are totally unworthy of the suffrage. But I think it is possible to increase the electoral body of the country by the introduction of voters upon principles in unison with the principles of the constitution, so that the suffrage should remain a privilege, and not a right—a privilege to be gained by virtue, by intelligence, by industry, by integrity, and to be exercised for the common good of the country. I think if you quit that ground—if you once admit that every man has a right to vote whom you cannot prove to be disqualified—you would change the character of the constitution, and you would change it in a manner which will tend to lower the importance of this country. Between the scheme we brought forward and the measure brought forward by the honourable member for Leeds, and the inevitable conclusion which its principal supporters acknowledge it must lead to, it is a question between an aristocratic government in the proper sense of the term—that is, a government by the best men of all classes—and a democracy. I doubt very much whether a democracy is a government that would suit this country; and it is just as well that the House, when coming to a vote on this question, should really consider if that be the real issue, between retaining the present constitution—not the present constitutional body, but between the present constitution and a democracy.

It is just as well for the House to recollect that what is at issue is of some price. You must remember, not to use the word profanely, that we are dealing really with a peculiar people. There is no country at the present moment that exists under the circumstances and under the same conditions as the people of this realm. You have, for example, an ancient, powerful, richly-endowed Church, and perfect religious liberty. You have unbroken order and complete freedom. You have estates as large as the Romans ; you have a commercial system of enterprise such as Carthage and Venice united never equalled. And you must remember that this peculiar country with these strong contrasts is governed not by force ; it is not governed by standing armies—it is governed by a most singular series of traditionary influences, which generation after generation cherishes and preserves because they know that they embalm customs and represent the law. And, with this, what have you done ? You have created the greatest empire that ever existed in modern times. You have amassed a capital of fabulous amount. You have devised and sustained a system of credit still more marvellous, and above all, you have established and maintained a scheme, so vast and complicated, of labour and industry, that the history of the world offers no parallel to it. And all these mighty creations are out of all proportion to the essential and indigenous elements and resources of the country. If you destroy that state of society, remember this—England cannot begin again. There are countries which have been in great peril and gone through great suffering ; there are the United States, which in our own immediate day have had great trials ; you have had—perhaps even now in the States of America you have—a protracted and fratricidal civil war which has lasted for four years ; but if it lasted for four years more, vast as would be the disaster and desolation, when ended, the United States might begin again, because the United States would only be in the same condition that England was at the end of the War of the Roses, and probably she had not even 3,000,000 of population, with vast tracts of virgin soil and mineral treasures, not only undeveloped but undiscovered. Then you have France. France had a real revolution in our days and those of our predecessors—a real revolution, not merely a political and social revolution. You had the institutions of the country uprooted the orders of society abolished—you had even the landmarks and local names removed and erased. But France could begin again. France had the greatest spread of the most exuberant soil in Europe ; she had, and always had, a very limited population, living in a most simple manner. France, therefore, could begin again. But England—the England we know, the England we live in, the England of which we are proud—could not begin again. I don't mean to say that after great troubles England

would become a howling wilderness. No doubt the good sense of the people would to some degree prevail, and some fragments of the national character would survive ; but it would not be the old England—the England of power and tradition, of credit and capital, that now exists. That is not in the nature of things, and, under these circumstances, I hope the House will, when the question before us is one impeaching the character of our constitution, sanction no step that has a preference for democracy, but will maintain the ordered state of free England in which we live. I do not think that in this country generally there is a desire at this moment for any further change in this matter. I think the general opinion of the country on the subject of Parliamentary Reform is that our views are not sufficiently matured on either side. Certainly, so far as I can judge, I cannot refuse the conclusion that such is the condition of honourable gentlemen opposite. We all know the paper circulated among us before Parliament met on which the speech of the honourable member for Maidstone commented this evening. I quite sympathize with him ; it was one of the most interesting contributions to our elegiac literature I have heard for some time. But is it in this House only that we find these indications of the want of maturity in our views upon this subject ? Our tables are filled at this moment with propositions of eminent members of the Liberal party—men eminent for character or talent, and for both—and what are these propositions ? All devices to counteract the character of the Liberal Reform Bill, to which they are opposed : therefore, it is quite clear, when we read these propositions and speculations, that the mind and intellect of the party have arrived at no conclusions on the subject. I do not speak of honourable gentlemen with disrespect ; I treat them with the utmost respect ; I am prepared to give them the greatest consideration ; but I ask whether these publications are not proofs that the active intelligence of the Liberal party is itself entirely at sea on the subject ?

I may say there has been more consistency, more calmness, and consideration on this subject on the part of gentlemen on this side than on the part of those who seem to arrogate to themselves the monopoly of treating this subject. I can, at least, in answer to those who charge us with trifling with the subject, appeal to the recollection of every candid man, and say that we treated it with sincerity—we prepared our measure with care, and submitted it to the House, trusting to its candid consideration—we spared no pains in its preparation : and at this time I am bound to say, speaking for my colleagues, in the main principles on which that bill was founded—namely, the extension of the franchise, not its degradation, will be found the only solution that will ultimately be accepted by the country. Therefore, I cannot say

that I look to this question, or that those with whom I act look to it, with any embarrassment. We feel we have done our duty ; and it is not without some gratification that I have listened to the candid admissions of many honourable gentlemen who voted against it, that they feel the defeat of that measure by the Liberal party was a great mistake. So far as we are concerned, I repeat, we, as a party, can look to Parliamentary Reform not as an embarrassing subject ; but that is no reason why we should agree to the measure of the honourable member for Leeds. It would reflect no credit on the House of Commons. It is a mean device. I give all credit to the honourable member for Leeds for his conscientious feeling ; but it would be a mockery to take this bill ; from the failures of the government and the whole of the circumstances that attended it, it is of that character that I think the House will best to do its duty to the country, and will best meet the constituencies with a very good understanding if they reject the measure by a decided majority.

SIR HUGH BELL

C.B., D.C.L.

(1844-).

IRONMASTER, mine owner, and managing director of some large manufacturing firms, he was born in Durham in 1844, and received a comprehensive education at Edinburgh, Gottingen, and Paris.

Sir Hugh Bell is an acknowledged authority on Economics.

Being a large employer of labour, he was able to make a close study of the social conditions of the worker. In this he was assisted by his wife, Lady Bell, who has written a standard work, "At the Works," on conditions in an industrial town.

Hugh Bell contested Middlesbrough in the Unionist interest and was a candidate in the City of London election of 1910.

ECONOMIC SCIENCE AND STATISTICS

(Delivered in 1919).

THE cessation of hostilities did not carry with it the cessation of expenditure. The figures given each week in the "Economist" show the daily disbursements of the kingdom to have amounted to £6,500,000 for the twenty-one weeks from November 16 to April 12. Our expenditure from August 24 to November 9 amounted to £585,500,000. From November 23 to July 8 we expended £564,000,000, a reduction of only £21,500,000, or about £250,000 a day. The debt with which the war burdened us continued to augment long after the cause of it had ceased to operate. We are still vastly exceeding our income. Even if we take into account the interest on the war debt, which amounts to about £1,000,000 a day, it is clear that the various obligations undertaken by the Government during the war continue to impose on us a huge expenditure which is largely in excess of our revenue.

New claims are made on the national purse and are accepted with the same apparent light-heartedness and disregard of consequences which mark so many previous acts of those responsible for our expenditure both during the war and before it.

The call made on the men and women of the nation for services differing from those to which they had been accustomed involves great changes in the conditions of those affected. Some compensation for these sudden changes was, no doubt, inevitable. The disorganisation of the whole industrial machine made it difficult, if not impossible, to turn these different classes adrift into a world in the chaotic condition into which the war had thrown it. But it does not follow that this compensation should have been given in a way actually to encourage unemployment. There are only too many indications of a general tendency to extravagant expenditure which must be checked before the course of our economic existence can return to normal lines. To enable us to do this we must consider what has happened to the world economically since August, 1914.

Can anyone doubt the huge destruction of wealth which has occurred? But it is really worse than it appears, for the very process of destruction was even more costly than the damage which was done. Millions of tons of steel in the form of guns and their projectiles—millions of lives had gone to produce this untoward result. For fifty months all the energies of the most active and energetic people on the globe had been turned from beneficial enterprise to work of which the result was the annihilation of vast masses of wealth.

When all these things are considered it is not surprising to find our estimate of the cost of the war reaches a total the mind cannot grasp. When you begin to speak of pounds by thousands of millions, the difference between twenty-five and forty is scarcely noticeable. But be the sum larger or smaller, the all-important fact to be borne in mind is that the wealth which it represents has passed out of being.

So much confusion exists on this subject that it is worth while dwelling on it for a moment. Some contend that there has been a mere change of wealth from one ownership to another. Into whose possession, may we ask, has passed the wealth which used to exist in the towns and villages and cultivated land of the battle area? It is true that the steel which went to effect this destruction has been paid for, but from what source has that payment come? Let us think what might have happened but for the war. The steel might have made rails and been laid on a railway to bring the produce of Central Africa to lands ready to pay for it and desiring to consume it for useful purposes. For all time there would have arisen in the process an income which would have gone to support in comfort those receiving it, and its surplus after this had been effected would have served to add yet more miles of railway and to bring yet more tons of useful produce. All this energy has been

dissipated in the manner indicated, and all that remains is the obligation of the "State" for all time to pay interest on a debt which has been created.

There is, as it seems to me, but one way to escape from the situation we have created. No measure of confiscation, however disguised, will remove the burden under which we lie. It may be decided to alter the incidence of the burden from one set of shoulders to another. Any proposal of the kind must have very careful and earnest consideration.

If a really sound and equitable scheme of taxation could be devised, each taxable unit would contribute to the common fund raised for the purpose of the Government an amount which would be arrived at after due allowance was made for his services to the community and his ability to pay. A bachelor, with no claim on him but to support himself without State aid, who had done nothing to provide for a citizen to take his place in the fullness of time, might be called upon to pay more than a man under obligation to maintain a family, and supply, by his children, the means of carrying on the torch of progress.

One of the chief objections of graduation seems to be the danger of gradually increasing the steepness of the scale until the higher incomes would be taxed out of existence and the revenue they produced disappear. This would, no doubt, bring its own remedy. The State needs a certain annual revenue to provide the services demanded by the community. If the result of taking much the greater part of incomes over a certain amount ends by extinguishing these, the State will cease to derive the revenue on which it counts. It must then either reduce the tax on them until a point is reached at which they will continue to exist, or it must increase the tax on all or some of the other incomes. Unless it means to rush headlong into bankruptcy, it must find the point of equilibrium at which its scheme of graduated taxation continues to produce the revenue required, not in any one year, but in all future years. Such a scheme, could it be discovered, would meet entirely that very important desideratum of a tax, namely, that it should be based on ability to pay.

Two other points must be kept in view. A tax must be equitable in its incidence and reasonably continuous in its imposition. Given these three conditions, the economic burden of the impost will quickly fall on the right shoulders. We may dismiss the argument which asks for a levy on capital, and defends it against the accusation of being confiscatory on the ground that it is no more confiscatory than any other means of raising money by the State. No juggling with the balance-sheets of the nations of the world will get rid of the fact that many thousands of

millions of wealth slowly accumulated in the generations which lived before August, 1914, have been dissipated.

In the last five years all this has been changed. From August, 1914, to March, 1915, £450,000,000 were added. The next year added more than £1,000,000,000. By March, 1917, it stood at £3,906,000,000, and now it has nearly doubled, and is more than ten times what it was at the outbreak of the war.

It is true we have something to set against this vast sum. We have acted as the financial agents of our Allies. The sums we have found for them amount to close on £2,000,000,000. On the other hand, we have ourselves contracted debts abroad to the extent of well on to £1,500,000,000. On balance, therefore, we have interest to receive on about £400,000,000 to £500,000,000. But to enable the inhabitants of this country to find money for our Government, we have sold fully as large an amount of our holdings in foreign securities. It may be contended that we are little worse off. I fear on closer examination this view will not be found good.

Let us admit that our Allies will find no difficulty in paying the £100,000,000 a year or thereabouts due for the interest on their debt to us. We must recognise that this will make a serious draft on their resources. Very different were the securities held by individuals in this country with which they parted to take up each successive issue of Government Bonds at the urgent insistence of successive Chancellors of the Exchequer. The securities sold were usually first-class industrial or public utility issues. What have we got now? A charge on a heavily burdened country of which, it may be, many thousand acres have passed out of cultivation for years to come.

Put at the highest, not many of our millions of pounds will find their own interest. All the balance must come out of the product of the other and real industries of the debtor country, and to this branch of the subject we must now turn.

At the present moment it is of more vital importance than ever that we should come to a clear unprejudiced understanding on this subject. To judge by appearance, the vaguest opinions exist as to the capacity of the community to meet the various claims which are preferred for a share of the wealth from which alone these claims can be satisfied. Many people seem to think that no demand is too exorbitant. We are asked to provide houses by the hundred thousand, undeterred by the consideration that they will cost two-, three-, or even four-fold the amount at which they could have been built before the war. They are, moreover, to afford accommodation of a much better character than was thought;

sufficient a very short time ago. Houses built so recently as twenty years ago are no longer good enough for the social reformers of to-day. It is forgotten that something like 80,000 houses are needed each year to accommodate the growth of the population. There are to-day something more than eight million inhabited houses in Great Britain. Not more than half of these are above fifty years old. During the war housebuilding had almost ceased, but before 1914 the building of houses had been checked by two causes. The various Acts of Parliament dealing with matters affecting the building of houses had so enhanced their cost that there was the greatest uncertainty whether houses could be built to return a reasonable interest on their cost.

But the second cause was of as great, or possibly even greater, significance. The trade unions connected with the building trades had gradually succeeded in imposing conditions which had added enormously to the cost of building. It would not be difficult to show why this had been possible, but it would take us too far to follow this line of thought. The fact will not be denied by anyone conversant with the circumstances. The result of all this is a serious shortage of houses, and this it is proposed to make up by grants from the public purse. If this were the only demand of the kind we might face it with more equanimity than is in fact the case. But when we look elsewhere we see other claims comparable in their effects on the public purse, but differing in kind.

The railway enterprise in this country may serve as typical of what is meant. Prior to the war the railways were carrying on their duties in a manner which enabled the country to get through its business in a profitable and, on the whole, fairly satisfactory way. They earned sufficient revenue to pay a fair return to the shareholders. It is true the prospect was not reassuring. The railway management was meeting the usual contradictory claims preferred against almost every industry. It was asserted that they were rendering services which were not nearly so great as were demanded by their customers, and they were charging for them rates which were regarded as quite out of proportion to the value of the services. On the other hand, they were paying wages which the recipients thought entirely inadequate, for much longer hours of service than their workmen were disposed to give. Negotiations between the parties had obtained certain concessions as to hours of work, and also as to rates of pay ; but these were not accepted as sufficient and Parliament was called upon to intervene, with the result that statutory hours were imposed.

The very essential difference between hours of work or rates of pay resulting from convention between the parties interested and the same imposed by statute is often overlooked. The convention can be varied

to meet the varying circumstances. The statute provides a hard-and-fast rule, from which it is impossible to depart without incurring penalties.

When the railway companies pointed out the serious effect which these statutory obligations imposed on them had on their revenue-earning capacity, and sought power to increase the rates, their customers were up in arms. The very men who, in Parliament and elsewhere, were applauding the decision to give relief to the railway servants, resolutely refused to pay the extra cost thus incurred. With difficulty was Parliament induced to give the companies leave to add to their charges something towards meeting this cost. The companies found still greater difficulty in obtaining a settlement with their customers as to the amount which should be so added. The question was still awaiting a final settlement at the outbreak of war.

There has been a persistent demand by labour throughout the country for better pay, and an equally persistent demand for more leisure. To these demands no objection can be taken. On the contrary, rightly understood, they must meet with approval by all who desire to see the country, as a whole, happy and prosperous. But we must consider how they can be satisfied.

The only source from which satisfaction can be derived is the sum-total of the product of the industry of the country, and indeed of the world in the period under consideration. It must be noted that in many cases the product may not be realised within that period, as, for example, when a manufacturer holds large stocks of goods which he has not yet marketed, but on which much the greater part of the cost has been paid. It must also be noted that a very considerable part of the industry of the country does not add to the total product which is the subject of division, but is, in fact, a charge on that product. The whole burden is borne by those engaged in providing commodities or services necessary for the members. We touch at this point a very difficult problem, the proper solution of which may possibly show us how all our economic troubles may be ended. I can do no more than state it as briefly as may be.

There can be no question that a very great part of human activities is spent, and the resulting product used, in providing things which cannot be called necessities of existence. The simplest food, clothing, and shelter may be said to cover all that comes under this head. But life that gives us nothing but the indispensable minimum of these essentials would be so dull and monotonous as to be scarcely worth the exertion needed to procure them. We must have more than these if we are to get enjoyment as well as mere life. How much more can we claim—

perhaps we might say, extort—from our environment? And how shall this extra tribute be shared among us?

If we made a complete analysis of the division of the product of industry we should be astonished to find how large is the amount which remains after the essential demands have been satisfied. If we sought to classify our expenditure we might come to some such division as this :—

On essential needs.

On things making for the irreproachable amenities of life.

On luxuries which add to and aid our reasonable enjoyment.

On those which subserve mere pleasures.

On extravagant expenditure for which no justification can be offered.

It is difficult to draw any clear line between the heads of this very rough division. Each class passes imperceptibly into the next. Fortunately for our present purpose, we do not require to do this. It is enough that we should admit that not all activities are well directed, and that we consume a great many things we could do without. No class is exempt from this blame, if blame it be. Each is disposed to look askance at what is called the extravagance of some other. When people talk of waste, they often mean expenditure on things for which they themselves do not care. But the question is: How can we check this extravagance and provide more fully for the more essential needs of the whole people?

If rich men did not drive motor-cars or drink costly wines, would the people who produce these luxuries be better off? Or, if instead of making these things, they made articles needed for the mass of the people, could these buy the result if they had no more means than they now possess? Do we not come back at the end to the proposition that men can have more only if they have more to offer in exchange?

It may be contended that men have obtained more or less completely what they wanted most urgently. They wanted shorter hours. In many trades they have got them, and might have had them in more had they gone about it in the right way. They were not sufficiently desirous of having better houses, and they failed to procure what their well-wishers desired for them.

A relatively small part of the population does unquestionably get a very large share of the total income produced by the whole community. Can we do anything by which this share may be reduced without bringing about greater evils than those we seek to overcome? The history of the sumptuary laws does not encourage much hope that attempts to prevent expenditure in particular directions will have much success. My own studies had brought me, many years ago, to the conclusion that in every industry examined there is no way of giving to those engaged shares greatly differing from what has been afforded in the past. The margins

on which manufacture in general is conducted are too small to make it possible to give the larger contributors to the ultimate result any considerable addition to what they have been accustomed to receive. This impression was confirmed by the elaborate general survey of the industry of the kingdom carried out by the Census of Production of 1907.

No doubt labour (which is much the most important item of cost) has obtained a gradually increasing payment, though not necessarily any larger proportionate share. A steady improvement in the methods in which the labour of men is applied has resulted in enabling a larger product to be obtained. Each new implement, each fresh application of energy of various kinds, as, for example, steam and electricity, has meant that the individual man produced more in his day's work, and he got, in fact, a larger return for what he did. But at the same time the capital engaged was increased, and consequently the proportion of the product to be allotted to rewarding capital also increased. It is neither possible nor desirable to attempt to alter this state of things.

The whole question has been treated in a very masterly way by Prof. Bowley in a book published some months ago, entitled "The Division of the Product of Industry." Mr. Herbert G. Williams' pamphlet, entitled "The Nation's Income," also deals with the same subject with much care and skill. In it he makes a critical examination of Sir Leo Chiozza Money's book entitled "Riches and Poverty."

The conclusion reached in these publications is practically the same. It may be stated, in the cautious words with which Mr. Bowley ends his book :—

"This analysis has failed in part of its purpose if it has not shown that the problem of securing the wages, which people rather optimistically believe to be immediately and permanently possible, is to a great extent independent of the question of national and individual ownership unless it is seriously believed that production would increase greatly if the State were sole employer. The wealth of the country, however divided, was insufficient before the war for a general high standard ; there is nothing as yet to show that it will be greater in the future. Hence the most important task—more important immediately than the improvement of the division of the product—incumbent on employers and workmen alike, is to increase the national product, and that without sacrificing leisure and the amenities of life."

I shall have failed in my object if I have left my hearers under the impression that I am wedded to or pleading for any particular division of the wealth of the country. We hear much talk about abstractions called "capital" and "labour." The terms are convenient enough if we do not let ourselves be deluded with the idea that they mean more

than the sum of those who own the capital or supply the labour. Labour itself is a somewhat ambiguous term. Until comparatively recently the members of the "labouring classes" so called thought it was synonymous with the man who laboured with his hands. The Labour Party itself has been fain to enlarge its definition so as to include all those who "labour by hand or brain." Not one of us is independent of capital. The most poverty-stricken member of the community relies as implicitly on it as the richest among us. To talk of the "abolition of capital" is to use a form of words which is absolutely meaningless. What most people who use them really mean is one or other of two things, sometimes both at the same time—either that the capital is in the wrong hands and that it should not be held in the way or to the amount which is at present the case, or that the division of the joint product of capital and industry is defective and should be altered.

I see great difficulty in saying no man's fortune shall exceed some given sum, and even in saying no man shall bequeath to his survivors more than some very moderate amount. In either case, I should fear endangering that building up of capital which, however it may be divided, is essential to our national progress.

When we come to the division of the joint product of industry and capital other considerations become apparent. The question at once arises whether any other division would have been possible in the past, or could be accomplished in the future, without great changes in the way in which the product arises. Reference has already been made to my own examination of this matter, which leaves me in no doubt that any considerable increase of the part of labour would have left the share of capital so small as to have stifled enterprise.

This does not mean that large fortunes may not have been made by those whose skill and industry and enterprise enabled them to seize the advantages presented to them.

Those who cry out against capital overlook the fact that in modern industries no man can be set to work except by means of a capital sum first found for the purpose. In the industries I know best something above £200 is needed to put a man to work. The population of this country increases at the rate of about 1 per cent. per annum. This means that for every 1,000 men to whom employment is being given, about ten youths are ready to be set to work each year, and something above £2,000 must be found year by year to give them employment.

One further point must be made. Men see some great enterprise (and the railways will serve very well as an example), and look upon it as a capitalist organisation. But when the circumstances are examined it is found that it consists of a multitude of small holdings, and com-

paratively few of large amount. In the North-Eastern Railway something like 60,000 shareholders hold the £83,000,000 of capital of various denominations—say, on the average, some £1,400 each. Consider the widespread distress which would be caused if the income from the sum were to cease.

I have made a similar calculation for a large colliery undertaking in which I am interested, with the following result. The capital in shares and debentures is about £1,300,000. There are a little more than 1,800 shareholders. We employ 5,500 men. Each shareholder therefore provides employment for about three men, and holds on the average £725. Before long we shall require further capital. We see our way to enlarge our operations and so to provide employment near to their homes for the fifty to sixty youths who, each year, grow to manhood, and need productive employment if they are not to become burdens on the community. We hope our 1,800 shareholders will have laid by enough to provide the £12,000 a year which is necessary for this purpose. We are assuming they or someone will provide it, for we are using our resources (reserves and depreciation funds) in this way, and shortly it will be incumbent on us to fund this obligation and add it to our capital.

We are thus brought to the last subject which I desire to consider with you—the widespread tendency towards what is somewhat vaguely called Nationalisation. It may be questioned whether any large number of people have very clear ideas what is meant by the term.

Let us assume for the present purpose that it signifies that the State shall become the owner of any enterprise which is nationalised—as it owns the business of the Post Office, the Telegraphs, and the Telephones. Let us ask what advantages will be gained by the assumption of ownership. A centralised management, even of so simple a business as that of collecting and distributing letters and parcels, has not been an unqualified success. Where the business is more complicated, as in the other examples, the success has been even less conspicuous. What reason have we to hope, then, in such intricate matters as the railways or the mines, better results will follow ?

The incentive of individual gain will have disappeared, and with it the readiness to accept such risks as those to which reference has already been made. We may easily find that the developments needed to find employment for our young people are not forthcoming, for without such risks being run no growth of employment will take place. Unless I am much mistaken, a great temptation will be put before politicians to make concessions to the huge army of voters who will be in the direct employment of the Government.

The experience of these five years has failed to teach the lesson that you cannot touch one branch of labour without affecting all others. An advance of wages given to one section will inevitably be demanded by all others. The result will be prejudicial to the whole community. As regards international trade, we may find ourselves shut out of foreign markets because our wages are made artificially high, just as we should be excluded if, for example, the shipowners could compel us to pay inordinate freights on some indispensable raw material like cotton.

A cure will speedily come, but it may come after great suffering has been inflicted on the whole community. Parliament can easily impose on the employer, whether a private individual or the State, the payment of a certain wage if a man is employed, but one thing it cannot do, and that is compel the employment of the man at a wage which the price of the article he produces will not suffice to pay. The man will remain unemployed. That is the drastic remedy which economic law imposes. We may escape it by making up from some other source the deficiency if we insist on having the article and refuse to pay the cost. But this remedy is applicable only to some small part of our total product. When we come to such industries as those now talked of it is impossible. We must make the industry self-contained.

But it may be said that those most concerned are not striving alone, or even chiefly, for higher wages, but desire to participate in the management and to bear their part in deciding the questions of policy which up to now have been in the hands of the employers. To this no fundamental objection can be raised. The more completely the men engaged in any enterprise understand it, the better it will probably be for the whole. But large questions of policy require knowledge and appreciation of circumstances which can with difficulty be acquired by persons whose life is necessarily passed in quite other surroundings. That the fullest information should be given to the persons in question cannot be denied. The claim to deal with matters of management lying quite beyond their competence cannot be conceded. The final impulse comes from one mind which cannot divest itself of its responsibility or exercise it under such conditions as those suggested would impose.

A universal unrest pervades the world. This had indeed already become apparent before 1914. The war has exacerbated the symptoms which were already sufficiently menacing. Remedies by legislation had been applied here and elsewhere without success. In the nineteenth century the political emancipation of the inhabitants of this country was gradually effected. By the end of it freedom had been practically won. The great changes which occurred in the political condition of the country as it was before 1832 and as it became by the end of the century

had been brought about with relatively little trouble. It is not surprising that this should have led to the conclusion that economic changes could be effected with equal ease. Perhaps the confusion which we continually observe between a "law" imposed by the will of a legislature and a "law of Nature," so called, is responsible for this conclusion.

Having gained political freedom comparatively easily, people seem to have thought economic freedom could be got with equal facility. We have had numerous instances of this on which it is unnecessary to dwell. Concessions have been made by which, apparently, life was made much easier for certain people. But the fund out of which these concessions were to come has not been increased. Many of them, though not so intended, had the effect of positively lessening that total. In a perfect world it ought not to have had this effect, but, human nature being what it is, it was easy to foresee the result. It could have been foretold that a minimum wage established by law would sooner or later reduce the output of the man paid by piece. It had that effect on the coal-miners at a very early date after its enactment.

The demand for higher wages without a corresponding increased output was causing anxiety before the outbreak of war. The inordinate expenditure which the war brought with it seemed to justify the contention of the workmen that the claims they had put forward could easily have been met in the past, and must be conceded when things became normal again. It was forgotten that all thought of economic production had ceased. We were living, not on the earnings of the year, but on credit raised on our expectations of the future. In the past this course was also pursued, but (as has already been pointed out) in very different circumstances, for the capital thus created was calculated to yield an adequate return to the persons interested.

None of the remedies proposed touches the difficulty. We must obtain a larger product if we are to have more to divide. Restrictions in output, whether produced by the act of the legislature, the will of the worker, or (let us add) the hindrance of a tariff, will fail to effect this. None of the short cuts now proposed will lead us to our goal. Can we convince those most deeply interested of the truth of this? The task is not an easy one, for promises without end are made to accomplish what is desired without pursuing the patient and laborious course which alone can lead to a happy solution. For my part, I rely on the common sense of my fellow-countrymen. The speedy abolition of all artificial prices by which we shall get to know the real cost of what we buy will be a great help. We may hope that on this will follow an earnest desire on the part of all to do their best for the commonweal—convinced that on this intelligent altruism we are best serving our own ends. A better

division of industry would ensue. The net result would be a happy and contented nation, in which the efforts of each would be more guided by the common welfare than by the selfish desire for the advantage of the individual.

None of these things can be accomplished by Acts of Parliament. Statutory prices and statutory hours offer no solution—rather increase the evil than lessen it. There is no royal road by which we can travel to a solution. We must, by patience and mutual forbearance, seek to alter the present hostile attitude. We may frankly accept Prof. Cannan's opinion that "the economic organisation of the nineteenth and early twentieth centuries will not endure for ever, but will be gradually replaced by something else more suitable for its own day and generation."

Let all parties in the State bend themselves to this change, in which, again to quote Prof. Cannan, "free associations of free men able to go out and come in as each pleased would voluntarily give service for service, irrespective of domicile and nationality." This is a change which we may agree with him in thinking more "desirable than any restoration of the feudal system basing economic organisation on the territory of the lord, even if the personal lord of the Middle Ages is replaced by a Parliament elected by universal suffrage and proportional representation."

R. J. A. BERRY

(1867- 1.

THE present Professor of Anatomy at the University of Melbourne was born in Lancashire, the son of a colliery proprietor. He graduated at Edinburgh in 1891, and afterwards held the post of House Surgeon to the Regius Professor of Clinical Surgery, as well as other non-resident appointments in the Surgical House of the Royal Infirmary. In 1894 he took his M.D. with honours and gained the Gunning Victoria Prize in Surgery. Two years later he became Lecturer on Anatomy in the School of Medicine of the Royal Colleges, Edinburgh. He has held the post of Examiner in Anatomy in the Universities of St. Andrews, Dundee, Aberdeen, New Zealand and Adelaide.

BRAIN AND MIND

(Delivered at Melbourne, 1923).

BETWEEN the primitive type of central nervous system, with its purposeful reflex unconscious actions, as seen in the earthworm, and the highly complex brain of man, with its manifestations of speech, thought, reasoning, delayed reaction to the stimulus, memory, and so on, there is an immense gulf. So much so, indeed, that it is not uncommon to find the human mind spoken of as though it were something which had no physical basis. The truth is that all mental phenomena depend strictly on physical construction, and that the elementary basis of such construction is always the neuron.

The nervous system is everywhere built up of a series of long conducting neurons, connected by a series of shorter neurons. The former comprise the receptor and effector neurons, the latter the internuncial. Medical and physiological attention has been chiefly devoted to the long conducting neurons, because lesions occurring therein have been fairly obvious and are of everyday frequency. In the study of the phenomena of mind and its aberrations it is, however, the short internuncial neurons which become of supreme importance. In the human cerebrum a sufficient number of such neurons are massed together to give those special reactions to the environment which we

term "mind"; all mental phenomena are entirely conditioned by a highly complex series of neurons linked together in series of arcs.

Neurons are always linked together, for functional purposes, in neuronics arcs. A neuronics arc, of the simple type found in the segments of the earthworm, consists of :

- (1) A sensitive receiving organ (receptor or sense organ).
- (2) A conductor—that is, a receptor, sensory, or afferent neuron, which transmits the stimulus received in the form of a nerve impulse in an inward or central direction.
- (3) Short adjustor internuncial neurons; usually limited to the grey matter of the central nervous system, and found, in the case of the earthworm, in the neuropile of each segment, and, in the case of man, in the association areas of the human brain.
- (4) A second conductor—that is, an effector, motor, or efferent neuron, which transmits the nerve impulse in an outward or peripheral direction to—
- (5) The effector apparatus, which comprises the muscles, glands, or other organs of response, and the terminals of the efferent nerves upon them.

In the earthworm these elements of a neuronics arc are found in every segment. The receptor or sense organ is in the cuticle. When suitably stimulated it causes the receptor neuron to transmit a nerve impulse to the neuropile within the ganglion of the segment. The impulse is then conveyed to the internuncial neurons, and may pass thence in one of two directions. Assuming for the moment that the impulse is confined to the segment concerned, then the effector neuron is aroused to a discharge of nerve energy, and so the effector apparatus—the muscle of the segment—is stimulated to contract, and there is thus a direct reflex response to the original stimulus. Such an action is an unconscious purposeful reflex action.

In the common earthworm there is no "brain." The so-called "end-brain" of the earthworm is merely a fusion of certain ganglia, which dominate the local activities of the several segments and enable the animal to react, as a whole, to the external and internal bodily stimuli. The histological construction of this "end-brain" of the earthworm does not differ structurally from that of the neuropile of the segments, except in so far as it contains a larger number of integrating internuncial neurons.

The purposive character of the reflex actions seen in the earthworm, or as obtained experimentally from the spinal frog, has sometimes led

to the belief that such animals—spinal cord animals—have a guiding intelligence. "At the present time we recognize that every reaction of a living being must be purposive, in the sense of being adapted to the preservation of the species, if the latter is to survive in the struggle for existence. The question as to whether we are justified in predicating the existence of even a germ of consciousness or volition in the spinal animal must be decided in the negative." (Starling). As Sherrington expresses it, "where even simplest ideas are not, there cannot be consciousness." Consciousness, then, like all mental phenomena, primarily depends on a relative sufficiency of neurons at the cephalic end of the neural tube, in which the memories of previous receptor impulses may be stored up, and these the earthworm does not possess.

As increasing functional demands are made upon the nervous system in accordance with the increasing rises in animal intelligence, from purposeful unconscious reflex actions to complete voluntary and conscious control over these actions—that is, the power of delaying or inhibiting the effector responses to the receptor stimuli—the internuncial neurons not only increase in numbers and complexity of connexions, but they begin to be specialized for such purposes as correlation, association, and integration. Further, they tend to be collected together, as their numbers increase, into cerebral vesicles, at the cephalic end of the neural tube.

The immense gulf between the primitive nervous system of the earthworm and the complex brain of man, both structurally and functionally, is bridged by living and intermediate animal forms. If the central nervous system of such living animal forms as the earthworm, sea lamprey, teleostean fish, alligator, dog, anthropoid ape, and man be regarded in series, it will be observed that there is continually being added on to the cephalic end of the neural tube additional numbers of neurons linked together in series of arcs, and that these additional neurons are developed within successively added cerebral vesicles. The last one of these to be added in each animal form constitutes the "end-brain"—a somewhat misleading term, because it does not follow that the end-brain of one animal is the same as the end-brain of a higher animal. In fact, it is not. As each one of these new end-brains is added there is a shifting forwards to it of the higher functions of which the animal is capable, and the last added assumes control over all the older ones. This process of shifting forwards of cerebral function to a newly added end-brain is known as "telencephalization." The histological construction of these successively added end-brains involves the additions of an increasing complexity of internuncial neurons, so that comparative anatomy compels the conclusion that, no matter what may be the

behaviour or mentality of the animal, its physical instrument is always the neuron.

Every living animal reacts to its environment in accordance with the structural evolution of its nervous system—that is to say, its motions or behaviour must be strictly adapted to its requirements. If the environment be simple, little adaptation is needed and motion is correspondingly simple. Cajal recognizes five epochs or types of neuronics arcs through which centralized nerve control has passed. These are as follows :

1. The epoch of irritability, as in the sponges.
2. The epoch of the reflex arc, as in the coelenterates or sea anemone.
3. The epoch of the intersegmental reflex arc, as in the earthworm.
4. The epoch of the suprasegmental reflex neuron, as in the lower mammals.
5. The epoch of the psycho-associational neuron, as in man.

The inevitable and only logical conclusion is that the neuron, particularly the short interpolated or internuncial neuron, is the physical instrument of mind, and that consciousness, memory, speech, thought, and reason can only manifest themselves when there are a sufficiency of neurons for the purpose. If, in the human being—in whom it is estimated there are 9,280 million neurons in the cerebral cortex—these neurons should be markedly deficient from any cause whatsoever, there are produced equally marked aberrations of intelligence and mind.

Although stress has been laid upon the importance of the neuron in all mental phenomena, other factors are concerned :

1. The state of development and physiological condition of the neurons.
2. The number and nature of the receptor impulses transmitted to the central nervous system.
3. The potential energy developed by the neurons.

“ One of the most striking characters of the neurons, at all events in the higher vertebrates, is that, contrary to the cells of other organs, the whole of those which the adult animal is to possess are present at birth, gradually taking on functional activity. There is no evidence of any regeneration after destruction or death of any individual neuron.” (Bayliss). “ In the case of medullated nerves, the acquiring of the fatty or medullary sheath is the sign that the neuron is ready to transmit impulses.” (Harris). Without that sheath the neuron will not transmit

impulses—that is, until development is completed the neuron cannot function. Notwithstanding that, physiologically, little is certainly known as to the functions of the myelin sheath in medullated nerve fibres, it appears to be certain that myelination is essential to a correct and normal functioning of the central nervous system, as opposed to the automatic nervous system. But the anatomist is not unmindful of the fact that the whole of the white medullary centre of the cerebral hemisphere is entirely made up of many million myelinated association, commissural, and projection fibres, all lying in the closest juxtaposition, and he asks himself: Supposing those fibres should remain partially undeveloped—that is, only partially myelinated throughout the whole of life—can there be a normal mental functioning of the brain? Is it not more reasonable to suppose that under such conditions the nerve impulses will undergo dissipation before arriving at their correct destination and so give rise to hysterias and other mental conditions characterized by irresponsible reaction to the environment? Because, as Starling says, the main nerve tracts cannot be shown to be functional before the date at which they acquire their medullary sheath.

Again, the vast importance of temporary or permanent exhaustion of the nerve cells—that is, chromatolysis—in altering the mental reactions is not sufficiently realized. Sherrington's work has familiarized us with the incoming to the brain of enteroceptive impulses from the viscera and internal bodily world generally; of proprioceptive impulses from tendons, muscles, joints; and exteroceptive impulses from the external world around us; but whether the real significance and profound influence of these impulses on brain structure and the manifestation of mind are equally well understood is another question. As Flack and Hill remark, "exteroceptive, proprioceptive, and enteroceptive impulses stream into the central nervous system from the time of its embryonic development until death, ceaselessly modify the pattern of its structure, lay down the pathways of reflex actions, and establish habits."

Those of us who are called upon to study the aberrations of the human mind are painfully aware of the fact that "in the case of children deprived of the senses of hearing and vision from birth there results the condition known as 'idiocy from birth from deprivation of the senses.' They experience fewer sensations than healthy children, and are therefore mentally deficient, and have fewer fully developed cortical neurons." No explanation of emotions, passions, and moods, or of their appropriate motor or effector responses or inhibitions, can be accepted which is not equally applicable to all living animals in accordance with their position in the evolutionary scale and their nervous

systems. Such explanations must be further applicable to all conditions of health and disease under which those emotions are displayed, and this, in my judgment, is where psychology fails. Its explanations almost invariably forget these essentials, and its exponent almost equally invariably introduces his own personality into that of others. One's own individuality is compounded of one's own receptor impulses, and it is frankly impossible to believe that some other individual has experienced precisely the like impulses, or has had the same neuron patterns for those impulses to traverse, and the same number of nerve cells for their storage.

What is nerve energy? Just as the physicist uses the term "gravity" to denote a force which he can measure, and the influences of which he can observe, but of whose nature he knows little or nothing, so has the neurologist to employ the term "nerve impulse" or "nerve energy" to denote a phenomenon of which he knows little beyond its observable effects, and yet there are many nervous diseases where it is not improbable that there is an altogether abnormal and irregular discharge of nerve energy.

The whole construction of the vertebrate nervous system is such as to compel the conclusion that the innumerable short cortical cells of the human cerebral cortex, particularly those within the association areas, are the physical storehouses of memory, and hence of speech, reason, and thought. When, therefore, a well known English medical man writes that "nothing but hopeless confusion can result from the mixture of brain cells and ideas," I would rather state that it is exactly this divorce which is responsible for the hopeless confusion, and that the sooner we begin to visualize all mental phenomena in terms of cerebral neurons the more rapid will be our progress. If the ideas are not in the brain cells, where are they? And why is the human microcephalic idiot so hopelessly devoid of ideas if it is not because he is so grossly lacking in brain cells?

The whole phenomena of the acquisition of speech and the allied arts of reading, writing, and so forth, as well as their loss or impairment by disease, are much more nearly related to numbers of neurons than has been supposed. Marie urges that in true aphasia intellectual impairment is invariably present. He considers that the notion of intellectual impairment should dominate the doctrine of aphasia. On neurological grounds alone it is difficult to see how anyone can fail to be of this opinion.

Man is the only animal gifted with the powers of speech, with large association areas and an adequate supragranular cortex, and even then his neurons have to be laboriously taught to acquire those properties

of speech, reading, and writing which go to make education possible. If he is under-neuroned from the outset the acquisition of these properties is correspondingly difficult, and his intellect or mind will be correspondingly impaired.

The conception, which has so long been held in medicine, that there is some particular part of the cortex, such as Broca's area, which is the one and only area concerned in speech, is erroneous. At the best the occipital end of the third frontal convolution can be little more than the place of origin of, perhaps, the final common effector pathway. In the acquisition of speech many of the neurons of the association areas are vitally concerned, and it is by no means impossible, or even highly improbable, that many of these neurons are the physical storehouses of words and phrases. In accordance with neurological principles these neurons are parts of complicated neuronic arcs, and hence speech is often reflex or automatic in its manifestations.

Examples are common in which the mechanism of language is employed in a purely mechanical manner. Imbeciles can at times learn by rote long paragraphs of the meaning of which they are quite ignorant. Children learn a large portion of their lessons in the same unintelligent way. Many word complexes are often gone through in a purely mechanical manner, whilst the individual repeating them is thinking of something else. In the majority of persons the word vocabulary in daily use is very limited, and the phrase vocabulary is both extremely limited and remarkably stereotyped, and is often quite automatically employed.

Whilst it is extremely likely that there are, in the association areas of the human brain, regions where there is a convergence of neuronic arcs concerned in certain educational functions, such as writing, reading, and so on, it is most improbable that these are absolutely restricted areas, and consequently we should never expect, on neurological grounds, to find the same lesion producing precisely the same results in any two individuals, because there is the actual position of the lesion to be considered, its depth, the numbers of neurons possessed by the individual, and the number actually destroyed by the lesion. Hitherto clinical medicine seems only to have taken into account the precise site of the lesion, and seldom the depth, hence much of the confusion.

In the human brain the purely physical portions of the human neopallial cortex—that is, those concerned with sight, hearing, taste, general sensibility, voluntary motion, etc.—remain much as in other mammals, except that they are more richly endowed with supragranular cortical neurons linked up with each other and with other portions of the cortex by internuncial neurons, whereas the association areas become

greatly extended. Comparative anatomy, evolution, and histology, all compel the conclusion that the association areas of the human brain are the suprasegmental equivalents of the neuropile of the common earthworm. It is, therefore, the neurons of the association areas which form the physical instruments of speech, thought, reason, and the higher mental faculties, and the addition of these faculties is always strictly in accordance with additions of neurons linked together in complex arcs, until, according to Herrick, the sum total is reached, in the human cerebral cortex, of 9,280 million neurons—a number, immensely in excess of that possessed by any other animal.

The association areas of the human brain are the fields for all the higher mental functions—such as thought, memory, reason, and speech. The capabilities of the human individual in these directions will differ according to the number and mode of connexion of fully developed functioning neurons within these areas. "Special talents are due to differences in organization of special parts of the cortex." (Howell). These areas—particularly the prefrontal—are underdeveloped in low-grade aments (idiots and imbeciles) and to a lesser extent in high-grade aments (mental defectives). (Bolton). The importance of all this is that we are now beginning to know and to be able to prove that there are quite a number of human individuals who, from some cause or another, do not possess their fair share of cortical neurons.

As "bricks cannot be made without straw," neither can a brain deficient in cortical neurons give a normal reaction to the environment. From the neuronic standpoint all human individuals may be divided into three great groups: the cerebral aments who swell the ranks of our prisons, gaols, reformatories, and asylums, though I must not be supposed to imply that all such are aments; normal neuronic individuals who constitute the vast majority; and the multi-neuronic geniuses with more than their fair share of neurons. As a matter of fact there are far more cerebral aments outside these institutions than in them, and many of them find their way into our consulting rooms, or drift into the hands of cranks or quacks who are not improbably as under-neuroned as their victims.

Man is the only animal with highly developed association cortical areas. He is the only animal to speak, think, and reason, and he does so because he has not fewer than three times as many cortical neurons as any other animal; hence, a study of brain structure is an essential first step in the study of mind and its aberrations.

MRS. ANNIE WOOD BESANT

(1847-).

IN the pages of her interesting "Autobiography" Mrs. Besant reveals to us the fact that though born in London—"three-quarters of my blood and all my heart were Irish." To this Celtic ancestry we may probably attribute three of the principal traits in her character: great courage, enabling her to dare all conventions in support of her ardent convictions; a brilliant oratorical gift; and the profound yet reasoned mysticism wrought into the fibre of her personality and manifest from her earliest days.

The pages of her "Autobiography" show these innate tendencies. "I read tales of the early Christian Martyrs, and passionately regretted I was born so late when no suffering for religion was practicable; I spent many an hour in day-dreams, in which I stood before Roman judges, before Dominican Inquisitors, was tortured on the rack or flung to the lions. One day I saw myself preaching some great new faith to a vast concourse of people; they listened and were converted and I became a great religious leader." All this is significant as a foreshadowing of her future life, always devoted to the ardent propagation of some form of faith, even when, during one phase, it appeared to deal mainly in negations.

Her training as a girl was strongly Evangelical, and she became an earnest worker at a little Church of England Mission in one of the Slums of South London. Here she met the Revd. Frank Besant to whom she was married in her twentieth year. She continued her studies in Sociology and ultimately became a professed Socialist.

At the same time she made a study of the historical evidence for dogmatic theology, finally rejecting the Christian tradition.

Now began an unhappy period in her life. With uncompromising honesty and courage she refused to take further part in public worship and after a time of great unhappiness she became separated from her husband, home, and friends. Fronting the world as a heretic she had only one resource—her pen. From this period dates her friendship with the late Charles Bradlaugh with whom she gave a series of public lectures on secularism; and she also wrote constantly for his paper, "The National Reformer."

But under all these changing activities she felt a deep craving for some basic system which would help to explain the riddle of this unintelligible world. She had always been a student of philosophy but had never succeeded in finding what she sought until, in 1899, the late W. T. Stead asked her to review a famous Theosophical book: H. P. Blavatsky's "Secret Doctrine." Reading this book formed a turning point in her life and shortly after she became a member of the Theosophical Society, of which she was afterwards to become President.

Mrs. Besant, in addition to being one of the most brilliant of living orators, is also one of the most prolific of writers, and a long list of publications appear under her name in the Catalogue at the British Museum.

She resides for the greater part of the year at Adyar, Madras, the headquarters of the Theosophical Society, whence she makes periodical journeys to other parts of the world, in order to lecture on the "Wisdom of the East."

MAN: HIS NATURE AND HIS POWERS

(A Lecture delivered on board the "Kaisar-i-Hind," in the Red Sea, Oct. 30th, 1893).

I PROPOSE to put before you what Philosophy teaches concerning man: man's nature and man's powers, his possibilities in the future, as well as his state in the present. May I say in opening what I have to put to you, that I am simply laying before you that which I have been taught, and which I have to a considerable extent verified by my own personal experiment, so that it has become to me a matter of knowledge? I, however, only put it to you as a matter of reasonable hypothesis. I do not pretend to dictate to you your opinions; I do not pretend to formulate for you what you shall think, or what you shall reject. On each of you the responsibility of forming his own thought; on each of you the responsibility of accepting or rejecting, as your own reason, your conscience and your judgment may decide. All that the speaker can do, or has the right to do, is to put the truth as he sees it, leaving it to each individual to accept or to reject, the right and the duty being on each, and not on the one who speaks.

With regard to man, there is a fundamental difference in the conception of man as he is looked at in the East and in the West. According to the Esoteric Philosophy man is regarded essentially as a soul. What he may have of instruments which that soul employs, what bodies he may clothe himself in, what special forms he may adopt—all that is matter which changes in time and space. As you may read in the *Brihad Aranyaka Upanishad*: "As a goldsmith, taking a piece of gold, forms

another shape . . . so throwing off this body . . . the soul forms a shape." And so the man is the soul, the soul that lives to gather experience, that lives to subjugate external nature, that lives to unite itself with the Divine Spirit from whence it sprang; and as regards the soul's bodies, those differ as evolution proceeds, and the soul moulds them century after century into the fuller and more perfect expression of itself. But in the West, man is far more identified with his outer form; he identifies himself with his body and with his mind. To us the soul stands above body and mind, using both as instruments, whereas in the West, people think of themselves as consisting of body and of mind; and the things that interest them are the things that affect the body, while the mind, they think, is practically their master, and they never dream of mastering their own thoughts and being ruler of their own intellectual as well of their own physical domain.

In order that these distinctions may be understood, let us sketch the different "principles," as they are sometimes called—"states of consciousness," as they are called at other times—which make up man when you take him completely, as man physical, man psychical and man spiritual. Those are the three great divisions accepted, let me say in passing, by Christianity as much as by other religions. For you find St. Paul speaking of a man "as body, soul and spirit." I know that in popular Christianity the distinction between soul and spirit has very largely been lost. But that is not so in Christian philosophy. If you take the writings of the great thinkers of Christendom, those who have dealt with religion scientifically and philosophically, you will find they follow the lines laid down by the great Christian Apostle, and regard man as a triple and not only as a dual entity. Now the body which belongs to the man, which is a physical garment as we say, is a very changing and a very illusory thing, as I said to you the other night—changing continually from moment to moment, and from year to year; so that if you turn to any modern book on physiology you will find that every minute particle of your body changes absolutely and completely in the space of seven years, that not a fragment of it you had seven years ago is yours to-day. Not only so. In later investigations of physiology you will find it recognised in the West, that a great part, at least, of the body, is made up of minute lives, microbes as they are called; and whenever men of science are searching after the cause of disease, they are on the track of some particular microbe, and it has become one of their favourite recreations to cultivate the microbe and improve him, so that he may become less dangerous when he falls upon any particular body. In this, Western science is on the track of a great truth, and as far as it goes, it speaks rightly in the fact

that these microbes enter into the composition of the human body. It might go further : it might say that the whole body is made up of nothing else but microbes and more minute creatures still, so that the whole body of man is composed of tiny lives, lives each with its own independent existence, coming into the body and going out of it, taking while in the body the stamp of the individual man, of which, for a time, it forms a part. So that our bodies are like hosts of these tiny visitors, and each of us stamps on those particles of the body his own physical, and to a great extent, his mental, moral and emotional characteristics. Out of the great reservoir of nature, there pour through us these streams of tiny lives ; and each, while it remains in our keeping, receives our stamp and then passes on to form part of some other body—vegetable, mineral, animal, human, as the case may be. So that even physically we become the creators of the world in which we live. Even physically, the world as it surrounds us, is made up of that which we contribute, and is modified and changed according to the character of these constant contributions that we make. Into our bodies flow the tiny lives. There we feed them, poison them or purify them, pollute them or cleanse them, as the case may be. By our food and by our drink, by our thinking and by our living, we modify these tiny particles which are a passing part of ourselves : and then we send them out to affect others—to make part of the bodies of other people, to make part of the physical nature around us, modifying them according to the fashion in which we are living ourselves. This is the physical basis of human brotherhood, this the physical basis of the brotherhood of all that lives. And there is nothing that lives not. So that this constant interaction throws on each a responsibility, gives to each the responsibility of this creative power, of this transmuting and modifying influence. One by one we change each other's lives physically, day by day we affect each other's health mentally as well as morally. Sometimes it is said that the man who is evil in his living, as the drunkard, is only his own enemy. It is not so. He is the enemy of everything that surrounds him, of every life that comes in contact with his own. The terrible curse of the drunkard is that all these tiny lives are sent out from him, poisoned with the alcohol, to fall on the bodies of other men, women and children, carrying with them the poison that he has infused into them, and making him a focus of evil to all among whom he lives. Thus, learning what the physical body is, the Esoteric Philosophy makes us careful in our physical life. It carries on this sense of responsibility into the common actions, common thoughts of everyday and ordinary life, so that self-restraint in the body as well as in the mind, should be the note of the life of every true Theosophist.

Let me pass from the body to the next stage in man, that astral body to which I alluded the other night. Really the astral body should come first in our thought, for it is the stable matrix or mould, into which all these tiny physical lives pass, and out of which they pass again, the stable part of man which preserves the form, only slowly and gradually modified, which is more directly acted upon by the mind than the physical molecules, which affects the physical molecules in their arrangement, in that as you alter the matrix, these physical molecules must take on the form of the mould into which they run. This astral body of astral matter envelops every physical molecule, spreads out around the body, making a kind of atmosphere around each of us, extending some few feet away on every side, so that a clairvoyant looking at the body, sees the physical body surrounded by what is called an aura, that is, a vibrating mass of delicate matter, visible to anyone who is sensitive under special conditions, but visible normally to the clairvoyant, and differing in appearance according to the state of health, physical, psychical or mental, of the person whom it concerns. Now, that aura or atmosphere surrounding the body, which is in a sense an expansion of astral matter, is very closely connected with the mind; it is very easily affected by the mind of the person to whom it belongs, and also by the minds of others. These magnetic atmospheres that surround us (for in astral matter all magnetic forces play) bring us into contact one with the other, so that we affect each other unconsciously, as we sometimes say. Have you never felt on meeting a person for the first time an attraction or a repulsion which had nothing in it of intellectual judgment, nothing in it of previous knowledge or experience? You like a person—you cannot tell why; you dislike another—you have no reason for your dislike. Esoteric Philosophy explains to you the very simple reason that causes these strange antipathies and attractions. It is that every human being has his own rate of vibration, the vibration of this astral matter, so that it is always quivering backwards and forwards. It is one of the characteristics of this ethereal matter to be thrown easily into waves; and just as light is nothing more than waves of ether set in very rapid motion by a rapidly vibrating body, which we call luminous, because of the effect it has upon the eye, so this ethereal matter, which is part of our own bodies, is thrown into waves of definite length and definite frequency; and these vibrate always in and around us, and are part of ourselves, modified by our own characteristics. Just as striking two strings on a piano, you may have either harmony or discord, according to the length of the sound—waves set up by these vibrating strings, so you may have harmony or discord between the vibrating auras of two different people; and if the vibrations fall into harmony—that is,

if they bear a certain definite relation of wave length to each other—there is an attraction between the two : whereas, if they bear a different relation, you get discord—that is, friction and jangle, and you are repelled without understanding the reason.

It is this astral body and astral atmosphere which are the medium for all magnetic phenomena. All the effects we produce upon each other are modified by this astral atmosphere. All the effects that deal with emotions and passions, with all those sides of the human character which are of the nature of emotion, come to us by means of these astral vibrations.

Have you ever tried to think what oratory is ? It does not lie in the words that are spoken ; it does not lie in the thought that is behind the words. You might take in cold blood the most eloquent passage of some great oration, and read it calmly without any movement of the emotions, without any sense of passion or of vibrating enthusiasm in you. If you hear it spoken, it is different. Why ? It is because the thought of the speaker, working on his own astral atmosphere, throws that into vehement vibrations—vibrations of love or of hatred, passion or pity—vibrations of great enthusiasm ; and then these vibrations of his throwing the whole ether around him into wave motion, these waves strike person after person, making their own atmosphere vibrate, and then from one to another there flies the contagion until the whole crowd is moved as by a single impulse and a single will.

These are all results of this second part of man's nature, this astral atmosphere that penetrates and surrounds him, by means of which the mind works on physical matter. And not only in this fashion, but in many forms of nervous disease, in those strange crises of panic, in those often puzzling attacks of hysterical affection that rush through a whole hospital. There you have set up these vibrations in the astral atmosphere communicated from patient to patient, and bringing about nervous crises in the physical body which they control.

With regard to this astral body and atmosphere, many investigations are being made by modern science, and many of our acutest thinkers are beginning to realize that it is necessary to postulate such a nature in man in order to explain many of the obscurer phenomena, to which so much of our modern thought is directed. Into this part of man's nature fall all the phenomena of trance, all the lower phenomena of mesmerism, and many of the phenomena of hypnotism. Although mind comes into mesmeric and hypnotic phenomena, it works on the astral body of the person who is subject to the influence, and by producing effects in the astral body, brings about results in the physical. Psychologists in the West—men like Sidgwick, Sully, Bain, and many another of our leading

writers on psychology—have found that they cannot understand the workings of consciousness if they only study it in its waking state ; that is, if they only study the mind as we know it in our waking hours, they meet with phenomena that are quite inexplicable, and they have begun to study sleep-consciousness—a very bad name for it, but apparently there is no better, at present, in the English tongue—in order the better to understand the phenomena shown by the mind in its waking state. This sleep-consciousness includes all conditions of trance. There is this advantage of the trance condition—you can produce it at will ; and every scientist will tell you that if he wants to gain exact facts, he needs to control his experiments, and to shut out what he does not want, to include only the conditions which he desires in order that he may make his experiments. The moment he can produce these special conditions, he can work out all the facts he is in search of with less liability to error than would otherwise occur. By artificially inducing trance, human consciousness can be studied in a fashion which is normally impossible ; trance is produced sometimes by drugs, sometimes by mesmeric passes—that is, by the action of the mind and the will upon another, sometimes by hypnotism—that is, by using a mechanical stimulus like a revolving mirror or electric light (there are many ways of doing it)—fatiguing the external sense, so that the fatigue leads to paralysis of the cells of the nerve, and that paralysis is propagated backwards to the brain, producing ultimately a state of brain fatigue, brain paralysis, in fact, a state of coma. In these fashions, man may be thrown into these abnormal states of consciousness, and studied when consciousness is working in this particular state instead of in the normal condition. In hypnotism these results are brought about mechanically.

Mr. Braid, who first started these hypnotic experiments, brought them about by producing what he called a convergent strabismus. That is only a six-syllabled way of saying “a squint” ; but sometimes the scientific mind likes to speak in six syllables rather than in one, because it produces a certain sense of dignity which impresses the unscientific and thoughtless. Really what he did, was to make the patient squint upwards by putting an object slightly above the eyes so that they had to converge in looking at it. In that way he fatigued very seriously the nervous elements as well as the muscles of the eye ; and so the patient passed into a state of trance, from which Mr. Braid was able to obtain what are known as hypnotic phenomena. The older phenomena of mesmerism were brought about in a different way, by a person who was able to concentrate his will and his own magnetic force, throwing that force with all the strength of concentrated will on the person he desired to affect. He worked directly on the

astral body by means of mental action ; whereas the hypnotist works on the astral body by way of the physical, and so produces the bad physical effect, that by making artificial paralysis he fatigues the nerve and sets up unhealthy vibrations which tend to repeat themselves. Charcot always preferred to work on hysterical people, people with a tendency to epilepsy and other forms of mental disease ; those were the people most easily affected. He did not so much try to cure them, as to find out what results he could obtain from them, and the results were a further shattering of the nervous system as well as some exceedingly interesting psychical facts ; but these facts were largely obtained at the cost of the physical destruction of human beings, a thing utterly antagonistic to all morality, and which ought to be condemned as a kind of human vivisection, even more wicked and more cruel than the vivisection of the lower animals. The results thus obtained you may read in many books that have been published. I shall only take a few samples to show the way in which by means of the astral the mind may work upon the physical body and so bring about results which will lead us on to our next part, the working of mind in forming images, and so later in moulding physical matter at its own will.

Take an ordinary hypnotic or mesmeric experiment. I should prefer mesmerism. Personally, I do not now use any of these experiments (I used to do them in my early days of investigation, before I knew the harm I might work), as I think on the whole they are mischievous. A person is thrown into a trance, and in that state he is told, say, that on his hand at a certain hour in the day will appear symptoms of a burn, that the skin will get red, that pain will be felt, that a wound will appear like a wound formed by a red-hot poker, and that all the symptoms, inflammatory and other, of a burn will be present. He awakes out of the trance, and so far as you are able to discover he knows nothing of what has occurred during that time. The hour arrives which has been fixed for this appearance ; the skin begins to redden and pain is felt. The patient does not understand what is happening, but he is conscious that he is suffering pain. The symptoms become more acute ; the skin gradually assumes an appearance which it would assume if touched by a poker, and you have a burn produced, not by external lesion, but by the action of mind, the mind of the operator working through the astral body of the patient, setting up there the image of a burn which then reproduces itself on the physical molecules, which, as I explained before, are shaped and moulded by the astral matrix in which they are embedded. If, when in Paris, you go to the *Salpêtrière*, you can see a number of photographs which have been taken of burns which have thus been produced on the bodies of patients, and you may examine the doctors

who have produced these lesions and without external means have caused external injury.

This throws strong light on some so-called miracles. Where you have the production of what have been called the sacred stigmata—that is, the appearance on the hands and feet of the wounds of the Passion of Jesus—you are not face to face with a fraud, as many Protestants are apt to think, when dealing with a Roman Catholic miracle. You are not face to face with a case of deliberate self-deception any more than a wilful deception of others. You are simply face to face with hypnotic phenomena produced in highly nervous subjects—such, say, as secluded monks or nuns who have their minds fixed constantly on one idea, who very often remain for hours in a single position with eyes upturned towards the Crucifix—in that very position in which Braid used to bring on his hypnotic trance. So are really produced these marks upon the physical body, which by those who believe them to be miraculous are looked on as endorsing a particular form of faith, while by those who hold another form of Christianity, they are regarded as deliberate and wicked frauds. They are neither the one nor the other. Like all miracles they are reducible under law ; for a miracle is only the working of a law unknown to the people amongst whom the phenomenon occurs, and they, because they do not understand it, at once jump to the “supernatural,” forgetting that, as the Divine is the source of all, there can be nothing outside and beyond the divine nature and the divine will. Take then, that class of phenomena as interesting physically—as showing that you can produce physical results without what we call a physical cause—a thing which fifty years ago science would have said was impossible, which fifty years ago would have been denounced as fraud, as it was denounced when brought about a hundred years ago by a man like Mesmer. Orthodox science denounced him as a charlatan and a rogue. The century that followed has justified Mesmer, and has made some of us fairly indifferent when science calls out “fraud” about other phenomena which we know to be as real and as natural as those which were denounced as fraudulent by the science of the eighteenth century, and are boasted of as modern triumphs by the science of the nineteenth. These, however, are the least interesting of such phenomena. Far more interesting are the mental workings on the mind of the patient—placing before him thought images produced in the mind of the operator, and so enabling him to see as an image that which only exists as thought in the mind of the controller.

There is nothing miraculous about it ; it is a simple process, as simple as any electric message, which, as you know, may be produced by writing on a tape by alternating currents which produce, if you desire, a facsimile

of the writing of the operator at the other end. The difference between the working of the adept and the working of the electrician, is that the electrician wants an apparatus—a battery and a wire—to produce his result ; while the adept uses the brain as his battery and wire. For the human brain, as one of these adepts has told us, is a most marvellous generator of force, a most wonderful transmuter of mental into physical, and physical into mental forces. There takes place the great alchemy of nature, and it can be governed by a purified and concentrated will. If you ask me, “Can I do it ?” I reply, “No, you cannot, because you have not trained yourself.” Will you pardon me if I say what sounds very rude, that very few of you ever think at all ?

You drift. You do not think. You allow other people’s thoughts to drift into your minds from the mental and astral world. The minds of most of us are nothing more than hotels into which drift the visiting thoughts that are in the mental atmosphere around : they come in for a bit, stay for a time, and drift out again—drifting in and out. So, men and women scarcely ever really think. Some minds are more like dustbins than even hotels, and they put up a sort of label, “Rubbish may be shot here,” in the form of the most trivial and ridiculous novels, the most frivolous and childish newspapers. Yet men and women who spend hours in that fashion, wonder that they cannot manipulate the forces of the mind, or use the power of the will which needs years of training ere it becomes ductile and obedient to the soul.

If you want to see whether I am judging harshly, try and think for one minute of a single thing, and before you have thought of it half a minute the mind will be off on some other subject. Try and think of a watch for a minute after I have stopped talking, and before you have thought of it a quarter of a minute you will find yourself thinking, “What was it she said about it ? How did she look when she said it ? What was my neighbour doing at that particular moment ?” Everything except the one thing of which you are trying to think. Then, perhaps, you will convince yourself, as I convinced myself by that very experiment, how very little power you have over the mind, how much you are at the mercy of outside thoughts, instead of using them as you yourselves please.

Or take another case. You have some great and pressing anxiety. You can do nothing at the moment ; yet it will keep you awake all night. Why ? Because it is your master instead of your mastering it. If you knew the life of the soul, if you understood the powers of the soul, you would never think of anything save that which you desired to think of, and which you are using for some purpose. If you had coming on, say, some great lawsuit, and could do nothing to influence the result

you would not think of it until the time came : you would give your whole mind to other thought that was useful and spare yourself needless worry, which ages and kills far more than anything else. Let me say in passing that the power to do it is one of the great experiences which have come to us in the knowledge of Eastern thought. For, at least, we have among the Hindoos not great numbers who can do it, but great numbers who put before themselves that as an ideal, who know that it can be done, who realize the possibility, and who are standing witnesses of this reality of the higher life of the soul, and the possibility of rising above body and mind into the true life where all causes have their place.

HUGH BLAIR

(1718-1800).

THE author of the famous treatise on "Rhetoric and Composition" was born at Edinburgh in April, 1718. He was educated in his native city, and in 1730 entered the University there, graduating as Master of Arts nine years later. About this time he read some lectures before the University dealing with the English language and its composition. They were approved by the authorities and secured Blair the post of Regius Professor of Rhetoric.

He was now one of a distinguished literary circle that embraced Adam Smith, Hume, A. Carlyle, and others among its members. This communication with some of the greatest writers of the day, doubtless, did much to provide material for the celebrated "Lectures on Rhetoric" which were not published until 1783. Ten editions were rapidly published and they were translated into French; and until the rise of a new school, they passed as models of English style.

Blair's long but uneventful life came to an end after a very brief illness, in 1800.

ON GENTLENESS

TO be wise in our own eyes, in the opinion of the world, and to be wise in the sight of God, are three things so very different, as rarely to coincide. One may often be wise in his own eyes, who is far from being so in the judgment of the world; and to be reputed a prudent man by the world is no security for being accounted wise by God. As there is a worldly happiness, which God perceives to be no other than disguised misery; as there are worldly honours, which, in His estimation, are reproach; so there is a worldly wisdom, which in His sight is foolishness. Of this worldly wisdom the characters are given in the context, and placed in contrast with those of the wisdom which is from above. The one is the wisdom of the crafty, the other that of the upright. The one terminates in selfishness, the other in charity. The one is full of strife and bitter envyings, the other of mercy and of good fruits. One of the chief characters by which the wisdom from above is distinguished is gentleness, of which I am now to discourse. Of this there is the greater

occasion to discourse, because it is too seldom viewed in a religious light, and is more readily considered by the bulk of men as a mere felicity of nature, or an exterior accomplishment of manners, than as a Christian virtue, which they are bound to cultivate. I shall first explain the nature of this virtue, and shall then offer some arguments to recommend, and some directions to facilitate, the practice of it.

I begin with distinguishing true gentleness from passive tameness of spirit, and from unlimited compliance with the manners of others. That passive tameness which submits without struggle to every encroachment of the violent and assuming forms no part of Christian duty ; but, on the contrary, is destructive of general happiness and order. That unlimited complacency which, on every occasion, falls in with the opinions and manners of others, is so far from being a virtue that it is in itself a vice, and the parent of many vices. It overthrows all steadiness of principle, and produces that sinful conformity with the world which taints the whole character. In the present corrupted state of human manners, always to assent and to comply is the very worst maxim we can adopt. It is impossible to support the purity and dignity of Christian morals without opposing the world on various occasions, even though we should stand alone. That gentleness, therefore, which belongs to virtue, is to be carefully distinguished from the mean spirit of cowards and the fawning assent of sycophants. It renounces no just right from fear. It gives up no important truth from flattery. It is indeed not only consistent with a firm mind, but it necessarily requires a manly spirit and a fixed principle, in order to give it any real value. Upon this solid ground only the polish of gentleness can with advantage be superinduced.

It stands opposed not to the most determined regard for virtue and truth, but to harshness and severity, to pride and arrogance, to violence and oppression. It is, properly, that part of the great virtue of charity which makes us unwilling to give pain to any of our brethren. Compassion prompts us to relieve their wants. Forbearance prevents us from retaliating their injuries. Meekness restrains our angry passions ; candour, our severe judgments. Gentleness corrects whatever is offensive in our manners ; and, by a constant train of humane attentions, studies to alleviate the burden of common misery. Its office, therefore, is extensive. It is not, like some other virtues, called forth only on peculiar emergencies, but it is continually in action when we are engaged in intercourse with men. It ought to form our address ; to regulate our speech, and to diffuse itself over our whole behaviour.

I must warn you, however, not to confound this gentle wisdom, which is from above, with that artificial courtesy, that studied smoothness

of manners, which is learned in the school of the world. Such accomplishments the most frivolous and empty may possess. Too often they are employed by the artful as a snare, too often affected by the hard and unfeeling as a cover to the baseness of their minds. We cannot, at the same time, avoid observing the homage which, even in such instances, the world is constrained to pay to virtue. In order to render society agreeable, it is found necessary to assume somewhat, that may at least carry its appearance. Virtue is the universal charm. Even its shadow is courted when the substance is wanting. The imitation of its form has been reduced into an art ; and, in the commerce of life, the first study of all who would either gain the esteem or win the hearts of others is to learn the speech and to adopt the manners of candour, gentleness, and humanity. But that gentleness which is the characteristic of a good man has, like every other virtue, its seat in the heart ; and, let me add, nothing, except what flows from the heart, can render even external manners truly pleasing. For no assumed behaviour can at all times hide the real character. In that unaffected civility which springs from a gentle mind, there is a charm infinitely more powerful than in all the studied manners of the most finished courtier.

True gentleness is founded on a sense of what we owe to Him who made us, and to the common nature of which we all share. It arises from reflection on our own failings and wants, and from just views of the condition and the duty of man. It is native feeling, heightened and improved by principle. It is the heart which easily relents, which feels for everything that is human, and is backward and slow to inflict the least wound. It is affable in its address and mild in its demeanour ; ever ready to oblige, and willing to be obliged by others ; breathing habitual kindness towards friends, courtesy to strangers, long-suffering to enemies. It exercises authority with moderation, administers reproof with tenderness, confers favours with ease and modesty. It is unassuming in opinion, and temperate in zeal. It contends not eagerly about trifles ; slow to contradict, and still slower to blame ; but prompt to allay dissension and to restore peace. It neither intermeddles unnecessarily with the affairs, nor pries inquisitively into the secrets of others. It delights above all things to alleviate distress, and if it cannot dry up the falling tear, to soothe at least the grieving heart. Where it has not the power of being useful, it is never burdensome. It seeks to please rather than to shine and dazzle, and conceals with care that superiority, either of talents or of rank, which is oppressive to those who are beneath it. In a word, it is that spirit and that tenor of manners which the Gospel of Christ enjoins, when it commands us to bear one another's burdens ; to rejoice with those who rejoice, and to weep with those who weep ;

to please every one his neighbour for his good, to be kind and tender-hearted, to be pitiful and courteous, to support the weak, and to be patient towards all men.

Having now sufficiently explained the nature of this amiable virtue I proceed to recommend it to your practice. Let me, for this end, desire you to consider the duty which you owe to God ; to consider the relation which you bear to one another ; to consider your own interest.

I. Consider the duty which you owe to God. When you survey His works, nothing is so conspicuous, as His greatness and majesty. When you consult His Word, nothing is more remarkable, than His attention to soften that greatness, and to place it in the mildest and least oppressive light. He not only characterises Himself as the " God of consolation," but, with condescending gentleness, He particularly accommodates Himself to the situation of the unfortunate. " He dwelleth with the humble and contrite. He hideth not His face when the afflicted cry. He healeth the broken heart, and bindeth up their wounds." When His Son came to be the Saviour of the world, He was eminent for the same attribute of mild and gentle goodness. Long before His birth, it was prophesied of Him, that He should " not strive, nor cry, nor cause His voice to be heard in the streets ; that the bruised reed He should not break, nor quench the smoking flax " (Matt. xii, 19, 20). And after His death, this distinguishing feature in His character was so universally remembered, that the Apostle Paul, on occasion of a request which he makes to the Corinthians, uses those remarkable expressions, " I beseech you by the meekness and gentleness of Christ " (2 Cor. x., 1). During all His intercourse with men, no harshness, or pride, or stately distance, appeared in His demeanour. In His access, He was easy ; in His manner, simple ; in His answers, mild ; in His whole behaviour, humble and obliging. " Learn of Me," said He, " for I am meek and lowly in heart." As the Son of God is the pattern, so the Holy Ghost is the inspirer of gentleness. His name is the Comforter, the Spirit of grace and peace. His fruits, or operations on the human mind, are " love, meekness, gentleness, and long-suffering " (Gal. v. 22). Thus, by every discovery of the Godhead, honour is put upon gentleness : it is held up to our view, as peculiarly connected with celestial nature. And suitable to such discoveries, is the whole strain of the Gospel. It were unnecessary to appeal to any single precept. You need only open the New Testament to find this virtue perpetually inculcated. Charity, or love, is the capital figure ever presented to our view ; and gentleness, forbearance, and forgiveness, are the sounds ever recurring on our ear.

So predominant, indeed, is this spirit throughout the Christian dispensation, that even the vices and corruption of men have not been

able altogether to defeat its tendency. Though that dispensation is far from having hitherto produced its full effect upon the world, yet we can clearly trace its influence in humanising the manners of men. Remarkable, in this respect, is the victory which it has gained over those powers of violence and cruelty, which belong to the infernal kingdom. Wherever Christianity prevails, it has discouraged, and, in some degree, abolished slavery. It has rescued human nature from that ignominious yoke, under which, in former ages, the one-half of mankind groaned. It has introduced more equality between the two sexes, and rendered the conjugal union more rational and happy. It has abated the ferociousness of war. It has mitigated the rigour of despotism, mitigated the cruelty of punishments ; in a word, it has reduced mankind, from their ancient barbarity, into a more humane and gentle state. Do we pretend respect and zeal for this religion, and at the same time allow ourselves that harshness and severity which are so contradictory to its genius ? Too plainly we show that it has no power over our hearts. We may retain the Christian name ; but we have abandoned the Christian spirit.

II. Consider the relation which you bear to one another. Man, as a solitary individual, is a very wretched being. As long as he stands detached from his kind, he is possessed neither of happiness nor of strength. We are formed by nature to unite ; we are impelled towards each other by the compassionate instincts in our frame ; we are linked by a thousand connections, founded on common wants. Gentleness, therefore, or, as it is very properly termed, humanity, is what man, as such, in every station, owes to man. To be inaccessible, contemptuous, and hard of heart, is to revolt against our own nature ; is, in the language of Scripture, to "hide ourselves from our own flesh." Accordingly, as all feel the claim which they have to mildness and humanity, so all are sensibly hurt by the want of it in others. On no side are we more vulnerable. No complaint is more feelingly made, than that of the harsh and rugged manners of persons with whom we have intercourse. But how seldom do we transfer the case to ourselves, or examine how far we are guilty of inflicting on others, whose sensibility is the same with ours, those very wounds of which we so loudly complain ?

But, perhaps, it will be pleaded by some, that this gentleness, on which we now insist, regards only those smaller offices of life, which in their eye are not essential to religion and goodness. Negligent, they confess, of the government of their temper, or the regulation of their behaviour, on slight occasions ; they are attentive, as they pretend, to the great duties of beneficence ; and ready, whenever the opportunity presents, to perform important services to their fellow-creatures. But let such persons reflect, that the occasions of performing those important

good deeds very rarely occur. Perhaps their situation in life, or the nature of their connections, may in a great measure exclude them from such opportunities. Great events give scope for great virtues ; but the main tenor of human life is composed of small occurrences. Within the sound of these lie the materials of the happiness of most men ; the subjects of their duty, and the trials of their virtues. Virtue must be formed and supported, not by unfrequent acts, but by daily and repeated exertions. In order to its becoming either vigorous or useful, it must be habitually active ; not breaking forth occasionally with a transient lustre, like the blaze of the comet ; but regular in its returns, like the light of day ; not like the aromatic gale, which sometimes feasts the sense ; but like the ordinary breeze, which fans the air, and renders it healthful.

Years may pass over our heads, without affording any opportunity for acts of high beneficence or extensive utility. Whereas not a day passes, but, in the common transactions of life, and especially in the intercourse of domestic society, gentleness finds place for promoting the happiness of others, and strengthening in ourselves the habit of virtue. Nay, by seasonable discoveries of a humane spirit, we sometimes contribute more materially to the advancement of happiness, than by actions which are seemingly more important. There are situations, not a few, in human life, where the encouraging reception, the condescending behaviour, and the look of sympathy, bring greater relief to the heart, than the most liberal supplies of bounty. While, on the other side, when the hand of liberality is extended to bestow, the want of gentleness is sufficient to frustrate the intention of the benefit. We sour those whom we meant to oblige ; and, by conferring favours with ostentation and harshness, we convert them into injuries. Can any disposition then be held to possess a low place in the scale of virtue, whose influence is so considerable on the happiness of the world ?

Gentleness is in truth the great avenue to mutual enjoyment. Amidst the strife of interfering interests, it tempers the violence of contention, and keeps alive the seeds of harmony. It softens animosities, renews endearments, and renders the countenance of man a refreshment to man. Banish gentleness from the earth ; suppose the world to be filled with none but harsh and contentious spirits ; and what sort of society would remain ? The solitude of the desert were preferable to it. The conflict of jarring elements in chaos ; the cave, where subterraneous winds contend and roar ; the den, where serpents hiss, and beasts of the forest howl, would be the only proper representations of such assemblies of men. " Oh that I had wings like a dove ! for then I would fly away, and be at rest. Lo ! then I would wander far off, and remain

in the wilderness. I would hasten my escape from the windy storm and tempest. For I have seen violence and strife in the city. Mischief and sorrow are in the midst of it. Deceit and guile depart not from the street" (Psalm lv. 6, 7, 8). Strange! that where men have all one common interest, they should so often absurdly concur in defeating it. Has not Nature already provided a sufficient quantity of unavoidable evils for the state of man? As if we did not suffer enough from the storm which beats upon us without, must we conspire also, in those societies where we assemble to find a retreat from that storm, to harass one another? But if the sense of duty, and of common happiness, be insufficient to recommend the virtue of which we treat, then let me desire you—

III. To consider your own interest. Whatever ends a good man can be supposed to pursue, gentleness will be found to favour them. It prepossesses and wins every heart. It persuades when every other argument fails; often disarms the fierce, and melts the stubborn, whereas harshness confirms the opposition it would subdue; and of an indifferent person creates an enemy. He who could overlook an injury committed in the collision of interests will long and severely resent the slights of a contemptuous behaviour. To the man of gentleness the world is generally disposed to ascribe every other good quality. The higher endowments of the mind we admire at a distance; and when any impropriety of behaviour accompanies them, we admire without love. They are like some of the distant stars, whose beneficial influence reaches not to us. Whereas, of the influence of gentleness, all in some degree partake, and therefore all love it. The man of this character rises in the world without struggle, and flourishes without envy. His misfortunes are universally lamented; and his failings are easily forgiven.

But whatever may be the effect of this virtue on our eternal condition, its influence on our internal enjoyment is certain and powerful. That inward tranquillity which it promotes is the first requisite to every pleasurable feeling. It is the calm and clear atmosphere, the serenity and sunshine of the mind. When benignity and gentleness reign within, we are always least in hazard of being ruffled from without; every person, and every occurrence, are beheld in the most favourable light. But let some clouds of disgust and ill-humour gather on the mind, and immediately the scene changes; Nature seems transformed, and the appearance of all things is blackened to our view. The gentle mind is like the smooth stream, which reflects every object in its just proportion, and in its fairest colours. The violent spirit, like troubled waters, renders back the images of things distorted and broken; and communicates to them all that disordered motion which arises solely from its own agitation.

Offences must come. As soon may the waves of the sea cease to roll, as provocations to arise from human corruption and frailty. Attacked by great injuries, the man of mild and gentle spirit will feel what human nature feels ; and will defend and resent as his duty allows him. But to those slight provocations, and frivolous offences, which are the most frequent causes of disquiet, he is happily superior. Hence his days flow in a far more placid tenor than those of others ; exempted from the numerous discomposures which agitate vulgar minds. Inspired with higher sentiments ; taught to regard with indulgent eye the frailties of men, the omissions of the careless, the follies of the imprudent, and the levity of the fickle, he retreats into the calmness of his spirit, as into an undisturbed sanctuary ; and quietly allows the usual current of life to hold its course.

This virtue has another, and still more important connection with our interest, by means of that relation which our present behaviour bears to our eternal state. Heaven is the region of gentleness and friendship ; hell, of fierceness and animosity. If then, as the Scripture instructs us, " according to what we now sow, we must hereafter reap," it follows that the cultivation of a gentle temper is necessary to prepare us for future felicity ; and that the indulgence of harsh dispositions is the introduction to future misery. Men, I am afraid, too often separate those articles of their belief which relate to eternity from the ordinary affairs of the world. They connect them with the seasons of seriousness and gravity. They leave them, with much respect, as in a high region, to which, only on great occasions they resort ; and, when they descend into common life, consider themselves as at liberty to give free scope to their humours and passions. Whereas, in fact, it is their behaviour in the daily train of social intercourse, which, more than any other cause, fixes and determines their spiritual character ; gradually instilling those dispositions, and forming those habits, which affect their everlasting condition. With regard to trifles, perhaps their malignant dispositions may chiefly be indulged. But let them remember well, that those trifles, by increasing the growth of peevishness and passion, become pregnant with the most serious mischiefs ; and may fit them, before they are aware, for being the future companions of infernal spirits only.

I mean not to say, that in order to our preparation for heaven, it is enough to be mild and gentle ; or that this virtue alone will cover all our sins. Through the felicity of natural constitution, a certain degree of this benignity may be possessed by some whose hearts are in other respects corrupt, and their lives irregular. But what I mean to assert is, that where no attention is given to the government of temper, meetness for heaven is not yet acquired, and the regenerating power of religion is

as yet unknown. One of the first works of the Spirit of God is, to infuse into every heart which it inhabits that "gentle wisdom which is from above." "They who are Christ's have crucified the flesh with its affections and lusts ;" but let it not be forgotten, that among the works of the flesh, hatred, variance, emulations, wrath, strife, and envyings, are as expressly enumerated, as uncleanness, murders, drunkenness, and revelling. They who continue either in the one or the other, "shall not inherit," indeed cannot inherit, "the kingdom of God."

Having thus shown the importance of gentleness, both as a moral virtue and as a Christian grace, I shall conclude the subject with briefly suggesting some considerations which may be of use to facilitate the practice of it.

For this end, let me advise you to view your character with an impartial eye ; and to learn from your own failings to give that indulgence which in your turn you claim. It is pride which fills the world with so much harshness and severity. In the fulness of self-estimation, we forget what we are. We claim attentions to which we are not entitled. We are rigorous to offences, as if we had never offended ; unfeeling to distress, as if we knew not what it was to suffer. From those airy regions of pride and folly, let us descend to our proper level. Let us survey the natural equality on which Providence has placed man with man, and reflect on the infirmities common to all. If the reflection on natural equality and mutual offences be insufficient to prompt humanity, let us at least remember what we are in the sight of God. Have we none of that forbearance to give to one another, which we all so earnestly entreat from Heaven ? Can we look for clemency or greatness from our Judge, when we are so backward to show it to our own brethren ?

Accustom yourselves also to reflect on the small moment of those things which are the usual incentives to violence and contention. In the ruffled and angry hour, we view every appearance through a false medium. The most inconsiderable point of interest or honour swells into a momentous object, and the slightest attack seems to threaten immediate ruin. But after passion or pride has subsided, we look round in vain for the mighty mischiefs we dreaded. The fabric which our disturbed imagination had reared totally disappears. But though the cause of contention has dwindled away, its consequences remain. We have alienated a friend, we have embittered an enemy, we have sown the seeds of future suspicion, malevolence or disgust. Suspend your violence, I beseech you, for a moment, when causes of discord occur. Anticipate that period of coolness, which of itself will soon arrive. Allow yourselves to think how little you have any prospect of gaining by fierce contention ; but how much of the true happiness of life you are certain of

throwing away. Easily, and from the smallest chink, the bitter waters of strife are let forth ; but their course cannot be foreseen ; and he seldom fails of suffering most from their poisonous effect, who first allowed them to flow.

But gentleness will, most of all, be promoted by frequent views of those great objects which our holy religion presents. Let the prospects of immortality fill your minds. Look upon this world as a state of passage. Consider yourselves as engaged in the pursuit of higher interests ; as acting now, under the eye of God, an introductory part to a more important scene. Elevated by such sentiments, your mind will become calm and sedate. You will look down, as from a superior station, on the petty disturbances of the world. They are the selfish, the sensual, and the vain, who are most subject to the impotence of passion. They are linked so closely to the world ; by so many sides they touch every object, and every person around them, that they are perpetually hurt, and perpetually hurting others. But the spirit of true religion removes us to a proper distance from the grating objects of worldly contention. It leaves us sufficiently connected with the world, for acting our part in it with propriety ; but disengages us from it so far as to weaken its power of disturbing our tranquillity. It inspires magnanimity, and magnanimity always breathes gentleness. It leads us to view the follies of men with pity, not with rancour ; and to treat, with the mildness of a superior nature, what in little minds would call forth all the bitterness of passion.

Aided by such considerations, let us cultivate that gentle wisdom which is, in so many respects, important both to our duty and our happiness. Let us assume it as the ornament of every age, and of every station. Let it temper the petulance of youth, and soften the moroseness of old age. Let it mitigate authority in those who rule, and promote deference among those who obey. I conclude with repeating the caution, not to mistake for true gentleness that flimsy imitation of it called polished manners, which often among men of the world, under a smooth appearance, conceals much asperity. Let yours be native gentleness of heart, flowing from the love of God, and the love of man. Unite this amiable spirit with a proper zeal for all that is right, and just, and true. Let piety be combined in your character with humanity. Let determined integrity dwell in a mild and gentle breast. A character thus supported will command more real respect than can be procured by the most shining accomplishments when separated from virtue.

SIR ROBERT LAIRD BORDEN

(1854-).

ON the resignation of Sir Charles Tupper, Robert Laird Borden, who had been one of the most effective speakers on the Conservative side in the Canadian Parliament between 1896 and 1900, became leader of the Conservative Opposition in 1901, showing himself on occasion a not unequal match for Sir Wilfrid Laurier in debate and greatly increasing his reputation in Europe and America. On questions of naval defence and others of vital interest in the Imperial and Colonial policies of Great Britain, he won the respect and confidence of British Conservative leaders in a way that made his name prominent in the London Press and turned British attention to him as the Balfour of Canada.

He was born in Grand Pré, Nova Scotia, June 26th, 1854, and was called to the bar in 1878. In his profession his success was distinguished before and after he entered public life. Becoming Queen's Counsel in 1891 and President of the Nova Scotia Barristers' Society (1893-1904), he began his service in the Canadian Parliament as Member for the City and County of Halifax, in 1896. Among degrees conferred on him are those of D.C.L. by Queen's University, Ontario, in 1903, and LL.D. by St. François Xavier University in 1905.

Borden became Prime Minister in 1911. He marked a fresh stage in the evolution of Imperial politics, by attending a Cabinet Meeting when visiting London in July, 1915. He was Canada's Chief Plenipotentiary Delegate at the Paris Peace Conference in 1919.

He resigned the Premiership in 1920, and in 1922 published "Canadian Constitutional Studies."

HOPE FOR LIBERTY AND DEMOCRACY

(From his speech before the Canadian Club of Boston, March 23rd, 1910).

THERE are some who prophesy that the institution of government by the people will not be enduring whether in the United States or within the British Empire. They affirm that in the modern stress and strain of everyday life, in the tremendous competition which besets us more and more in every walk and occupation, it is impossible to expect that the strong, progressive and intelligent elements of the community will give to the public affairs and to the service of the state that measure of their energies, that vigilant attention and that earnest and abiding interest without which no government can truly be of the public. The criticism and the prophecy, however pessimistic they may appear, deserve the most profound attention from every lover of his country and from every friend of progress and liberty. Their justification and fulfilment would mean that these democracies will eventually revert to a more absolute form of government in pure despair at conditions which the present system must bring to pass. I believe with an unwavering confidence that liberty and the right of self-government will be justified of their children. But it is not in the true interest of the people to overlook the deficiencies of popular government, whether in our country or in your own.

Mr. Bryce in a series of thoughtful and instructive lectures at Yale has told us that these deficiencies are due to three great causes, indolence, self-interest and party spirit. Perhaps I am expressing the same idea in other words, but to me it seems that the cause lies in the lack of moral earnestness, in the absence of a sense of individual responsibility and in a certain spirit of soulless commercialism, which has attended modern industrial development, especially upon this continent, and which pardons everything to success. Let us beware lest the spirit of the market-place dominate too greatly our ideals. Let us never forget that the life blood of the commonwealth is to be found, not in its abounding prosperity, but in its moral earnestness, its ethical standards of private and public life, and its spirit of intelligent and unselfish patriotism. By these it shall be judged and upon these it must rely in the ultimate test. The true ideals of democracy are impossible of attainment unless the individual citizen realizes and accepts his duty to the state. Individual responsibility for the good government of the commonwealth ought to be learned at every mother's knee, taught daily in the schools, preached continually from the pulpit and proclaimed everywhere by the press.

Humanity has its imperfections and shortcomings; therefore, democracy is not unsoiled or stainless. Thomas Carlyle had no great love or admiration for modern institutions and ideals. But he was at heart an optimist and the concluding sentence of his address to the Edinburgh students may well be the watchword of democracy:

“One last word. Wir heissen euch hoffen. We bid you hope.”

If the world spirit of liberty be not transitory, but eternal, there is hope for the future. The errant step, the loitering on the path, the stumbling by the wayside—be assured that these are but the phenomena of the moment. The river must be forded, the morass must be crossed, before the hill shall be gained. To despair of democracy is to despair of humanity. ‘Work and despair not.’ The years to come shall hail her as the mother triumphant.

SIR JAGADIS CHANDRA BOSE

(1858-).

ON the 30th November, 1858, Jagadis Bose was born in a respectable Hindu family which hailed from the Dacca District of Bengal. Jagadis was sent to an English school for education, afterwards joining St. Xavier's Collegiate School, Calcutta. In the splendid museum of Physical Science he drew his early inspiration in Physics from the brilliant educationalist the Rev. Father Lefont, who possessed the rare gift of enkindling the imagination of the young. In 1880 Bose graduated as Bachelor of Arts.

Young Bose then wished to go to England to further his educational studies. He was sent to Cambridge where he joined Christ's College. Soon afterwards he passed the B.A. examination and secured the B.Sc. honours degree of the London University.

He had the speculative Indian mind and his fertility as a discoverer is to be referred in a great measure to the harmonious blending of the burning imagination of the East with the analytical methods of the West. He was appointed Professor of Physical Science at the Presidency College, Calcutta. On the discovery by Hertz of the existence of electric waves, Professor Bose was inspired to commence research work.

Dr. Bose's abilities were recognised by the leading scientists of the world and he was sent at the head of three deputations to Europe and America in 1907, 1914, and 1919. Cambridge and London Universities conferred upon him the Honorary Degrees of M.A. and D.Sc.

THE WONDERS OF PLANT LIFE

(Delivered at Ashrama, Mayavati, India).

IN plant life a stimulus takes a certain time before it gets a response. This stimulus may be of different forms, *e.g.*, it may be a sound stimulus, a light stimulus, an electric stimulus, and so on. The feebler the stimulus, the greater is the time it takes to elicit the response. For instance, if one is called by a distant voice, one doubts whether he has been called at all, but in the case of a piercing scream, he starts up at once.

Now, the difficulty is that when the stimulus, the blow, is so strong as to get an instantaneous response, how is one to measure this infinitesimal time between the blow and the response? And this must be done absolutely free from any personal interference, so as to ensure correct results.

After deep thought and careful experiments and researches of several years I invented and manufactured a highly sensitive instrument which could automatically record the "response time" of a plant even to one thousandth part of a second. In order to convey a graphic idea of the principles under which it worked, I have made, by means of a few simple things, a crude form of the instrument, which will help us to form a clear idea of how a shock given to a plant would be recorded automatically by the apparatus by means of dots on its writing pad, and also how to ascertain the exact time each plant took to respond to the stimulus received. Thus the plant now records its own history unerringly by its own hand as it were. And that the same results are obtained each time the experiment is repeated under similar conditions, shows that this recording of the response time is a scientific phenomenon.

As an example of the similarities of reactions in plant and animal, I will describe the rhythmic activities of certain plants, in which automatic pulsations are maintained as in the animal heart. This phenomenon is exemplified by the Telegraph plant, which grows wild in the Gangetic plain; its Indian name is Bon charal or 'forest churl,' the popular belief being that it dances to the clapping of the hand. There is no foundation however for this belief. It is a papilionaceous plant with trifoliate leaves, of which the terminal leaflet is large, and the two lateral very small. Each of these is inserted on the petiole by means of pulvinule. The lateral leaflets are seen to execute pulsating movements which are apparently uncaused, and are not unlike the rhythmic movement of the heart to which, as we shall see later, their resemblance is more than superficial.

In the intact plant, under favourable conditions, these movements are observed to take place more or less continuously; but there are times when they come to a standstill. For this reason and because of the fact that a large plant cannot easily be manipulated as a whole and subjected to various changing conditions which the purpose of the investigation demands, it is desirable, if possible, to experiment with the detached petiole, carrying the pulsating leaflet. The required amputation however may be followed by arrest of the pulsating movements. But, as in the case of the isolated heart in a state of standstill, I found that the movement of the leaflet can be renewed, in the detached specimen, by the application of internal hydrostatic pressure. Under these conditions,

the rhythmic pulsations are easily maintained uniform for several hours. This is a great advantage, in as much as in the undetached specimen, the pulsations are not usually found to be so regular as they now become. So small a specimen, again, can easily be subjected to changing experimental conditions, such as the variation of internal hydrostatic pressure and temperature, application of different drugs, vapours and gases.

Under varying conditions the same plant has been observed to take different response times, as for instance, less in heat than in cold, less in summer than in winter, less in the morning than in the evening, and so forth. Again, different plants have different response times. It is a remarkable fact that the mimosa is ten times as sensitive as a frog in giving the response. And the idea that plants are of a lower order than animal life will cost many a sad disappointment.

As it has been the earnest endeavour of scientists to minimise material friction in order to get the best results, so in our human concerns, it should be our best aim to minimise friction,—which is, Ignorance.

HOW PLANTS CAN RECORD THEIR OWN STORY

(Delivered at Ashrama, Mayavati, India).

WE have now to consider the claims made by those who profess to discriminate character by handwriting. As to the authenticity of such claims, scepticism is permissible ; but there is no doubt that one's handwriting might be modified profoundly by conditions, physical and mental. There still exists, at Hatfield House, documents which contain the signature of the historical Guy Fawkes. A photograph projected on the screen shows a sinister variation in those signatures. The crabbed and distorted characters of the last words which Guy Fawkes wrote on earth tell their own tale of that fateful night. Such is the tale that might be unfolded by the lines and curves of a human autograph. Can plants be made similarly to write their own autographs revealing their hidden story ? Storm and sunshine, the warmth of summer and the frost of winter, drought and rain, come and go about the plants. What subtle impress do they leave behind ? How are the invisible internal changes to be made externally visible ?

I have succeeded in devising experimental methods and apparatus by which the plant is made to give an answering signal, which is then automatically recorded into an intelligible script. The results of the new investigations are so novel that I spent several years in perfecting automatic instruments which completely eliminate all personal equations.

The plant attached to the recording apparatus is automatically excited by a stimulus absolutely constant, making its own responsive records, going through its period of recovery, and embarking on the same cycle again without assistance at any point from the observer. The most sensitive organ for perception of a stimulus is the human tongue. An average European can by his tongue detect an electrical current as feeble as six micro-amperes, a micro-ampere being a millionth part of a unit of electrical current. I found that my Hindu peoples could detect a much feebler current, namely, 1.5 micro-amperes. It is an open question whether such a high excitability of the tongue is to be claimed as a distinct advantage. But the fact might explain the eminence of my countrymen in forensic domains! The plant, when tested, is found to be ten times more sensitive than a human being.

When the plant has a surfeit of drink, it becomes excessively lethargic and irresponsive. By extracting fluid from the gorged plant, its motor-activity is at once re-established. Under alcohol its responsive script becomes ludicrously unsteady. A scientific superstition exists regarding carbonic acid as being good for a plant. But my experiments show distinctly that the gas would suffocate the plant as readily as it does the animal. Only in the presence of sunlight can the effect be modified by secondary reaction.

By means of apparatus specially devised, pulsative plants are made to record their rhythmic throbbings. It is shown that the pulse beats of the plants are affected by the action of various drugs, and divers stimuli, in a manner similar to that of the animal heart. Perhaps the most weird experience is to watch the death-struggle of a plant under the action of poison. Turning from death to its antithesis life and growth, we are shown how the latter can be made visible by means of the new appliances. The infinitesimal growth of a plant becomes highly magnified in these experiments.

When I commenced my investigations, original research in India was regarded as an impossibility. No proper laboratory existed, nor was there any scientific manufactory for the construction of a special apparatus. In spite of these difficulties it has been a matter of gratification to me that the various investigations already carried out at the Presidency College have done something for the advancement of knowledge. The delicate instruments seen in operation at this lecture, which have been regarded with admiration by many distinguished scientific men in the West, are all constructed at the College workshops by Indian mechanics.

It is also with pride that I refer to the co-operation of my pupils and assistants, through whose help the extensive works, requiring ceaseless labour by day and night, all have been accomplished. Doubt has been

cast on the capacity of Indian students in the field of science. From my personal experience I bear testimony to their special fitness in this respect. An intellectual hunger has been created by the spread of education. An Indian student demands something absorbing to think about and to give scope for his latent energies. If this can be done, he will betake himself ardently to research into Nature, which can never end. There is room for such toilers who by incessant work will extend the bounds of human knowledge.

Before concluding I wish to remark on the fact that all the varied and complex responses of the animal have been foreshadowed in the plant. The phenomena of life in the plant is thus not so remote as has been hitherto supposed. The plant-world, like the animal, throbs with responsiveness to all the stimuli which falls upon it. Thus, community throughout the great ocean of life, in all its different forms, outweighs apparent dissimilarity. Diversity is swallowed up in unity.

LORD BRYCE

(1838-1922).

JURIST, statesman, and historian; was born at Belfast, in 1838, and educated at the High School, Edinburgh, and the Universities of Glasgow and Oxford. At the latter he took his B.A. degree in 1862, and his D.C.L., 1870. He went to the Bar in 1867 and practised in London for a few years, but was recalled to Oxford to become Regius Professor of Civil Law; a chair he held from 1870 until he resigned in 1893.

An ardent Liberal, he became M.P. for the Tower Hamlets—a London constituency—in 1880, and afterwards represented South Aberdeen, 1885-1906. During Mr. Gladstone's short administration he was Under-Secretary for Foreign Affairs. In August, 1892, he became Chancellor of the Duchy of Lancaster with a seat in the Cabinet. Under Lord Rosebery he was President of the Board of Trade and was successful in placing some important Acts on the Statute Book, chief of these being the Railway Rates Act, and the Merchant Shipping Consolidation Act of 1895. During the debates on Home Rule, 1886-1892, Bryce was a powerful supporter of Mr. Gladstone's Home Rule Policy. He was Chief Secretary for Ireland during 1905-6 in the Campbell-Bannerman Ministry; and the culminating point of his political career was reached in 1907 when he became British Ambassador at Washington. On the third of August, 1911, he signed the Anglo-American Arbitration Treaty on behalf of Great Britain. His Ambassadorship ended April, 1913, when he returned home after a long tour.

Lord Bryce's reputation as an historian rests upon his three classics: "The Holy Roman Empire," (1862), his great work on "The American Commonwealth," (1888), and "Modern Democracies," (1921).

He was a celebrated mountaineer, and he was a former President of the Alpine Club. His ascent of Mount Ararat in 1876, is described in the volume on "Transcaucasia and Ararat," published in 1877.

In 1914 his great services to his country were distinguished by elevation to the peerage, and in the same year he was appointed Chairman of the Committee of Inquiry instituted to inquire into the reports of German atrocities in Belgium.

THE VALUE OF SPEECH

(Address to the State University of Iowa, April, 1910).

EIGHTY years ago Thomas Carlyle preached the gospel of Silence, and denounced the growing tendency to talk in public. Since then the habit has increased, is increasing, and seems most unlikely to decrease. It may be true that everything worth saying has been said. Nevertheless, orations will go on as long as men are willing to listen.

You whom I see here present will join—some of you have already joined—the great army of orators, so it is natural that you should desire to have a few hints given you on the subject, even if they claim no other authority than that which fifty years of observation here and in Europe may seem to confer. They shall be put in the form of a few short maxims of a severely practical character. Most, perhaps all, of these maxims will appear obvious, but I give them not because they are novel, but because they are so constantly neglected as to be worth repeating.

1. Always have something to say. The man who has something to say and who is known never to speak unless he has, is sure to be listened to, especially in a deliberative assembly or wherever there is business to be done, while the man of mere words carries no sort of weight. Try to have an idea, or if you cannot find one—ideas are none too common—have two or three relevant facts. You may tell me that sometimes a man is forced to speak when there is nothing to be said. This does not often happen, because if you think a little before you rise, you will almost always find something bearing on the matter in hand, even if the occasion be a purely ornamental one. There is a well-known speech of Cicero's in which he had to present a legal case on behalf of a poet. He evidently knew that the legal case was weak, so he passed quickly and lightly over it, but made a graceful and eloquent discourse upon poetry in general. The theme was not very novel then, and is still less novel now, but the discourse was so finished in its language that it can still be read with pleasure. So when you have to propose the health of someone of whose personal merits you know nothing, you may say something about the importance of his office if he is a state governor or a mayor, or the services rendered by his profession if he is a surgeon, or if he is a newspaper reporter, Milton's *Areopagitica* with its stately argument on behalf of the liberty of unlicensed printing may suggest something appropriate. If you can find nothing at all to say, don't say it.¹ Your silence will not harm you in the long run.

Lord Brougham, who was a power in his day, though his eloquence does not suit our modern taste, advised young speakers to begin by acquiring fluency as the one indispensable thing, and William Pitt the younger is said to have acquired his marvellous command of words by having been trained by his father to translate rapidly at sight from Latin authors. Nevertheless there is such a thing as a fatal fluency. Whoever follows Brougham's advice ought to beware the habit of thinking more of the words than of the sense.

2. Always know what you mean to say. If possible consider beforehand what you are going to say, and make your own mind perfectly clear what is the argument which you want to put, or the facts you want to convey. If your own mind is muddled, much more muddled will your hearers be. Bring your thoughts to a point, reject whatever is irrelevant and be content if you have one good point and can drive it home. It is pitiable to see how often a man who really has some knowledge of his subject goes groping or stumbling about, trying to get somewhere, but not getting anywhere, not for want of words, but because he cannot put his ideas into the form of definite propositions. In trying to discover what it is that you mean, you may discover that you mean nothing. If so, the sooner you know it the better. Sometimes one hears a speech in the course of which the speaker gets his own mind clear, and comes at last to know what he means, but when it is too late to get hold of the audience. If he had thought the thing out beforehand, all would have gone well.

3. Always arrange your remarks in some sort of order. No matter how short they are to be, they will be the better for having a beginning, a middle, and an end. Nothing pleases an audience more than the sense that they are being led along a path towards a definite goal by a man who knows his way. It gives them confidence that the speaker understands what he is about and will bring them out all right somewhere. Do not, however, let your arrangements be so obtrusively elaborate as to alarm them. It used to be the fashion of Scottish preachers to divide their subject into three or four "heads," with a "firstly," a "secondly," a "thirdly," and so forth, under each head, so that the listener knew what a long road he had to travel. I remember one sermon in which a venerable minister got as far as nineteenthly under the second head. The process of classifying facts and arguments and placing them in their right order in one's own mind helps to clarify it, while it adds strength to the argument. It might also be said that a well-arranged speech is seldom a bad speech, because in the process of arrangement a man of any sense is sure to find out the deficiencies in his facts and the weak points in his arguments in time to cure them.

4. At all hazards, be clear. Make your meaning, whatever it is, plain to your audience. Though obscure speech is usually due to obscure thought, this is not always so. Some persons who think clearly have not learned to express themselves clearly, because they are nervous in public, or have an insufficient command of words. In such cases it may be better to resort to the expedient, otherwise to be deprecated, of reading a speech from manuscript rather than confuse the audience. You have, moreover, to think not of the form thoughts take in your mind, but of the form in which they will be comprehensible by your audience. Do not imitate the bishop who, preaching in a village church, told Hampshire rustics that "Nature herself shall be the palimpsest on which Omnipotence shall inscribe the character of a rejuvenated humanity." Let the construction of your sentences be simple enough for the hearers to follow, and the words such as they cannot fail to understand. To find themselves puzzled over your meaning, and while they are still puzzling over your last sentence, to be unable to attend to the next one, annoys your hearers and lessens the chance of pleasing or persuading them. Though obscurity of expression is mostly due to obscurity of thought it sometimes happens that people whose thought is clear enough insist on wrapping it up in vague and cloudy rhetoric. To the rule that lucidity is the first of merits, there is one exception, viz., where a speaker feels himself driven to the shelter of obscurity. I have seen astute debaters, compelled by their position to speak, unwilling to be untruthful, yet forbidden by considerations of prudence to speak out frankly all they thought, deliberately involve themselves in a web of words where each sentence seemed to have a meaning, but the hearers were left to wonder what the whole speech meant. But such contingencies are rare ; you may go through life without getting caught in one.

5. In controversial speaking, as, for example, in conducting a lawsuit or arguing a proposal in a deliberative body, think always of what your opponent will say, and so frame your speech as to anticipate his answers and give little opening for his criticism. The grounds of this rule are too obvious to need illustration. Add to it the old maxim that in replying you ought to meet and counter your adversary's jest by earnest, and his earnest by jest. Aristotle said it, but mother wit has taught it to many a man who never heard of Aristotle.

6. Always reflect beforehand upon the kind of audience you are likely to have, for even in the same country or in the same section of the country audiences are by no means the same, and what suits one may not suit another. I have known practised speakers throw overboard the speech they had intended to deliver and substitute something different when they looked from the platform over the faces beneath. If your

hearers are mostly educated men and women, you may assume much as already known which it would be proper to explain to persons of scantier knowledge. But it is safer to proceed on the assumption of ignorance (so long as you do not let the audience think you are talking down to them) than to assume knowledge. We are all of us more ignorant than other people know, or indeed than we know ourselves. If the audience are disposed to be hostile, you will begin by putting them in good humour, and trying to excite their curiosity as to the line you will take. If they are already wearied by the harangues of your predecessors, you will go at them with quick, sharp, bright, bold sentences, and will let them feel that you do not mean to detain them long. And you will watch them as you go along just as you would watch your fly on the surface of the water you are fishing.

7. Never despise those whom you address, whatever you may think of their intellectual attainments. Give them the best you have to give. You need not talk over their heads, as I once heard an eminent English historian, when he was candidate for a seat in Parliament, discourse to agricultural labourers upon the Landsgemeinde of the Forest Cantons of Switzerland. But you will find it politic as well as polite to respect them, and you must never think that your best thoughts, expressed in the fittest words, are too good for them. Though noisy and empty rhetoric will often draw cheers, still the masses of the common people almost always appreciate solid and relevant facts, sound and useful thoughts, stated in language they can understand, and there will probably be among them those who would perceive and resent any indication that you were talking down to their inferior capacity.

8. Be sparing of literary ornament, except in speeches that are of a frankly decorative kind, such as those made after dinner, or panegyrics of some notable person whom it is wished to honour. Just as an ornament should seem when used in architecture, to be an original and essential part of the whole design, so in oratory the decorative parts should be connected with, and naturally grow out of, the substance of the matter in hand, and should help to make the speech more vivid and telling, rather than seem stuck on in order to please the ear without strengthening the sense. Abraham Lincoln rendered a great service to American eloquence when he renounced the florid or tawdry style that prevailed in his day, and set an example of speaking that was plain, direct, and terse. Be sparing with superlatives; reserve them for occasions where they will really tell. Take pains to choose the strong and simple words, and the words that exactly fit the case. Even an audience that is not itself very cultivated feels the charm of choice and pointed diction, and of

words that have some touch of colour in them, such as apt metaphors. A well-chosen metaphor often clinches an argument, or becomes an illustration of it in miniature.

9. As respects humorous anecdotes, and jokes in general, these are eminently matters of individual taste, in which each man will please himself, and few general counsels can be given. Though we all envy the speaker who has plenty of merry jests, he needs to beware of abusing his gift. There is a tendency to-day to make after-dinner speaking a mere string of anecdotes most of which may have little to do with the subject or with one another. Even the best stories lose their charm when they are dragged in by the head and shoulders, having no connection with the allotted theme. Relevance as well as brevity is the soul of wit, for a good speech is a work of art, in which every part should have an organic relation to every other part. And when you tell a story, take some pains with the form of it. The late Mr. James Russell Lowell, whom we in England admired as the best after-dinner speaker of his day, was a master in that line. The classical felicity of his diction set off and gave a charm to the smallest anecdote he told.

10. Never, if you can help it, be dull. It is a fault to have too many flowers or too many fireworks, but it is a worse fault to be tedious. An eminent Oxford teacher of my undergraduate days, who is now a learned and distinguished English writer, coined for his pupils a phrase which had a great vogue in the University: "It is better to be flippant than to be dull." This audacious advice, meant for young writers, is even more applicable to young speakers, because, bad as dullness is in print, it is still worse when you cannot escape from it without quitting the dinner table. Many are the causes of dreariness in a speech. One is lack of good matter, for it often happens that the less a man has to say, the more he spins it out. A still commoner one is confused thinking, which makes the speaker lose himself in vague and pointless phrases. Another is monotony in language, the frequent repetition of the same words, because the speaker's vocabulary is scanty and he can command no others. You may ask how dullness can be avoided when the subject is not a lively one. Well, some subjects are dry. The treasurer of a city, or even of a baseball club, who is presenting his accounts, cannot make them fascinating. But dryness is not the same thing as dullness. The least promising subject may be treated with a conciseness and precision and lucidity which allow one the pleasure that good workmanship gives. A speech with those merits will not be dull. Though it may be dry, it will stand out sharp and clear, like a bare mountain peak in the desert of Arizona, and even to the driest topics you can impart

a little variety by a lively simile or an apt illustration. Dullness is often the result merely of monotony in voice and manner : and this brings me to another maxim.

11. Remember the importance of Delivery. Demosthenes, greatest of all orators, is reported to have said when asked what was the chief quality in oratory, Delivery ; and when asked what was the second and again what was the third, to have made the same reply. It is related that his own elocution and manner were at first poor, and were improved by incessant study and practice. Though a rich or sweet or sonorous and resonant voice is a gift of nature, care and training can do much to get good results out of a mediocre organ. Articulation, modulation, and expression may all be cultivated. To listen to words clearly and finely spoken, and to sentences in which the voice adapts itself to the subject, adds greatly to whatever pleasure a speech can give. However, the four suggestions I make to you are applicable to all, be their voices good or bad. First, Be sure you are heard. Better be silent than be indistinct. Secondly, Do not shout. It is not necessary. Take the measure of the room, look at the man in the last row, throw your voice out so as to reach him, watching his face to see if the words get there, and trust not so much to loudness as to clearness of enunciation and a measured delivery. Thirdly, Beware of exhausting your voice. Do not strain it, however large the room, to its utmost power, at least until near the end of your speech. Fourthly, Vary now and then the key or pitch of your voice. It relieves the listener, and suddenly to raise or lower the voice when there is any change in the topic often helps the sense of the words. A speech seems twice as long when it is delivered in a monotone, and most speeches are too long already.

Were I addressing an English audience I should add a fifth suggestion. Speak slowly. But the fault of going too fast is far less common here than in Britain ; indeed, some of your speakers tend to the opposite error of going too slow. Dr. Phillips Brooks is the only great American to whom I have ever listened who spoke very rapidly. It may interest you to know that John Bright, who was on the whole the greatest English orator of the last half century, told me that when he first began to speak in public his utterance was so rapid that on one occasion a newspaper reported an address he had made at a political meeting in the following words : " The next speech was made by our young townsman, Mr. John Bright, but he spoke so fast that our reporter was quite unable to follow him." When and after Mr. Bright had reached his prime, the measured deliberation with which he delivered his sentences made them tell like the blows of a hammer.

12. Never read from manuscript if you can help it, unless when the occasion is one of such exceptional solemnity or dignity that a long and highly finished piece of composition is expected. As for notes, the fewer the better, but if you find that you cannot trust your memory to supply the order of the topics and the particular points you wish to make, or illustrations you wish to intersperse, it is better to refer to your notes for these than miss the points altogether. There are speakers whose habit it is to carry notes in their pocket even when they hope not to use them. It gives confidence, and saves them from such a fiasco as I have seen befall even practised debaters in the House of Commons, when, having suddenly lost the thread of their discourse, they were obliged to sink sadly to their seats, amid the crushing commiseration of their opponents.

13. Whether you use notes or not, always have ready two or three sentences with which to sit down. You need not be either flowery or sublime in your closing words, but some sort of a peroration you ought to have at command, so as not to bungle and hesitate when the time for ending comes. How often do we see an unhappy fellow-creature go maundering or floundering helplessly along, amid the growing contempt of the audience, having already said all he had got to say, and yet unable to stop because he feels that a closing sentence is needed and he cannot find one.

14. Lastly—and this is a maxim which is of universal application. Never weary your audience. If they are tired before you rise to speak cut your speech short, unless you feel able to freshen them up and dispel their weariness. Just as physicians say that a man ought to leave off eating while he is still hungry enough to go on eating, so let your hearers wish for more food from you, rather than feel they have had too much already. Consider the hour of the evening and human weakness. One of the most successful speeches I remember to have heard of was made by a famous engineer at a great public dinner of the British Association for the Advancement of Science. He came last; and midnight had arrived. His toast was: “Applied Science,” and his speech was as follows: “Ladies and Gentlemen, at this late hour I advise you to illustrate the Application of Science by applying a lucifer match to the wick of your bedroom candle. Let us all go to bed.”

It might be rash to say that a short speech is never a bad speech, for I have known a man grieve his friends and ruin his case in five minutes. But for ten speeches that are too short there are a hundred that are too long. A lecture ought not to exceed fifty minutes, a sermon twenty-five minutes, an after-dinner speech (unless, of course, it is meant to be the chief address of the evening) fifteen minutes. For speeches in law-courts

or legislatures, where a mass of facts may have to be expounded and commented on, limits cannot be fixed, but all speeches everywhere gain by compression. Mr. Bright, like Chatham and most of our great orators, seldom spoke for more than an hour. Mr. Gladstone, like Edmund Burke, did not so restrict himself, and both these illustrious men suffered from their copiousness so far as the audience of the moment was concerned, though no one could wish Burke's magnificent orations, as we now have them in print, to be shorter by a sentence. Like Daniel Webster's, they are good all through.

The maxim not to tire or bore your audience is part of a wider precept ; viz., to remember the main purpose of a speech. Most speakers are beset, especially in their earlier days, by a temptation from which even those of longer experience are not exempt, the temptation to regard a speech as the opportunity for displaying talent rather than as a means to an end.

The aims or ends of speaking are commonly classed as two. One is to Persuade. The other is ~~to~~ Delight. In order to persuade a court or a jury you must think not of showing off your dialectical gifts, but of getting the judgment or the verdict. The best speech is the speech that convinces court or jury. In a legislative body, the best speech is that which draws votes, or if that be impossible, which puts heart into your own party. When the speech is meant not to persuade, but to give delight, there are three quarters in which pleasure may be felt ; the person in whose honour the speech is made, the audience, and yourself. It is a common error to think too much of the last and too little of the second. So long as you are mindful to say nothing unworthy of yourself, nothing untrue, nothing vulgar, you had better forget yourself altogether, and think only of the audience, how to get them and how to hold them. Keep your mind fixed upon your hearers and upon the end in view, whether it be to please or convince. Appreciation will come if it is deserved, and will come all the more if you do not too obviously play for it.

You will sometimes make failures, for nobody is always at his best. Do not be discouraged. The fault may not be your own, for much depends on conditions you cannot command. But when you feel you have fallen below the best that you can do, ask yourself why, and if the fault is in yourself, try to correct it next time.

LORD BYRON

(1788-1824).

GEORGE GORDON who became in 1798 sixth Lord Byron was born in January, 1788. His father was a captain in the army and a reckless spendthrift. His mother a foolish woman wholly incapable of bringing up a son. His later character was chiefly due to his unfortunate upbringing.

He passed from Harrow to Cambridge, where in 1807, he published two volumes of bad verse. Their hostile reception brought from him the stinging "English Bards and Scotch Reviewers." His career as writer had begun in earnest.

Two years later, after a Mediterranean cruise, he returned to England with the two first cantos of "Childe Harold." This publication made him immediately famous, and for the rest of his life he remained the most prominent of the English poets.

In the next few years appeared such popular pieces as "The Giaour," "The Bride of Abydos," "The Corsair" and "Lara." But up to 1816 nothing of his work is of great value or of any permanence. He had not yet expressed himself truly. But in this year came his exile from England, where on account of scandals about his private life, he was no longer tolerated by society. It was out of the suffering caused by this ostracism that his greatest poetry sprang. The next cantos of "Childe Harold," written after exile, ring with a new power and a new sincerity. "We learn in suffering what we teach in song," as Shelley knew.

He took up his residence in Italy, and in 1818 were written "Mazeppa," "Beppo," and the first canto of his greatest work "Don Juan"; and about the same time his plays and Memoirs were begun. Of his life in Italy there is abundant information that need not be recapitulated here. The best sources of knowledge are his excellent Letters.

As early as 1810 he had sympathised keenly with the cause of Greek freedom. And now in 1821 began the war of liberation from the oppression of the Turk. The poet of freedom sailed to help the revolution, and was acclaimed the leader of the struggling people. He

soon showed himself a born leader and statesman ; but difficulties and disease pursued and overcame him and before he had been four months on the mainland he died at Missolonghi on 19th April, 1824.

Byron is almost the best known of the poets. He is a great figure as well as a great poet and satirist, and the innumerable discussions of his life and work only testify to his appeal. His chief work is "Don Juan," which has been called not unjustly our second English epic, and upon this and on his Letters his fame securely rests.

THE LUDDITES

THE subject now submitted to your lordships for the first time, though new to the House, is by no means new to the country.

I believe it had occupied the serious thoughts of all descriptions of persons, long before its introduction to the notice of that legislature, whose interference alone could be of real service. As a person in some degree connected with the suffering county, though a stranger not only to this House in general, but to almost every individual whose attention I presume to solicit, I must claim some portion of your lordships' indulgence, whilst I offer a few observations on a question in which I confess myself deeply interested.

To enter into any detail of the Riots would be superfluous ; the House is already aware that every outrage short of actual bloodshed, has been perpetrated, and that the proprietors of the frames obnoxious to the rioters, and all persons supposed to be connected with them, have been liable to insult and violence. During the short time I recently passed in Nottinghamshire, not twelve hours elapsed without some fresh act of violence ; and on the day I left the county I was informed that forty frames had been broken the preceding evening, as usual, without resistance and without detection.

Such was then the state of that county, and such I have reason to believe it to be at this moment. But whilst these outrages must be admitted to exist to an alarming extent, it cannot be denied that they have arisen from circumstances of the most unparalleled distress. The perseverance of these miserable men in their proceedings, tends to prove that nothing but absolute want could have driven a large, and once honest and industrious, body of the people into the commission of excesses so hazardous to themselves, their families, and the community. At the time to which I allude, the town and county were burthened with large detachments of the military ; the police was in motion, the magistrates assembled, yet all the movements civil and military had

led to—nothing. Not a single instance had occurred of the apprehension of any real delinquent actually taken in the fact, against whom there existed legal evidence sufficient for conviction. But the police, however useless, were by no means idle: several notorious delinquents had been detected; men, liable to conviction, on the clearest evidence, of the capital crime of Poverty; men, who had been nefariously guilty of lawfully begetting several children, whom, thanks to the times! they were unable to maintain.

Considerable injury has been done to the proprietors of the improved frames. These machines were to them an advantage, inasmuch as they superseded the necessity of employing a number of workmen, who were left in consequence to starve. By the adoption of one species of frame in particular, one man performed the work of many, and the superfluous labourers were thrown out of employment. Yet it is to be observed, that the work thus executed was inferior in quality; not marketable at home, and merely hurried over with a view to exportation. It was called in the cant of the trade, by the name of ‘Spider work.’ The rejected workmen in the blindness of their ignorance, instead of rejoicing at these improvements in arts so beneficial to mankind, conceived themselves to be sacrificed to improvements in mechanism. In the foolishness of their hearts they imagined, that the maintenance and well doing of the industrious poor, were objects of greater consequence than the enrichment of a few individuals by any improvement in the implements of trade, which threw the workmen out of employment, and rendered the labourer unworthy of his hire. And it must be confessed that although the adoption of the enlarged machinery in that state of our commerce which the country once boasted, might have been beneficial to the master without being detrimental to the servant; yet, in the present situation of our manufactures, rotting in warehouses, without a prospect of exportation, with the demand for work and workmen equally diminished, frames of this description tend materially to aggravate the distress and discontent of the disappointed sufferers.

But the real cause of these distresses and consequent disturbances lies deeper. When we are told that these men are leagued together not only for the destruction of their own comfort, but of their very means of subsistence, can we forget that it is the bitter policy, the destructive warfare of the last 18 years, which has destroyed their comfort, your comfort, all men’s comfort? That policy, which, originating with “great statesmen now no more,” has survived the dead to become a curse on the living, unto the third and fourth generation! These men never destroyed their looms till they were become useless, worse than

useless ; till they were become actual impediments to their exertions in obtaining their daily bread. Can you, then, wonder that in times like these, when bankruptcy, convicted fraud, and imputed felony are found in a station not far beneath that of your lordships, the lowest, though once most useful portion of the people, should forget their duty in their distresses, and become only less guilty than one of their representatives ? But while the exalted offender can find means to baffle the law, new capital punishments must be devised, new snares of death must be spread for the wretched mechanic who is famished into guilt. These men were willing to dig, but the spade was in other hands : they were not ashamed to beg, but there was none to relieve them : their own means of subsistence were cut off, all other employments pre-occupied, and their excesses, however to be deplored and condemned, can hardly be subject of surprise.

It has been stated that the persons in the temporary possession of frames connive at their destruction ; if this be proved upon enquiry, it were necessary that such material accessories to the crime, should be principals in the punishment. But I did hope, that any measure proposed by his Majesty's government, for your lordships' decision, would have had conciliation for its basis ; or, if that were hopeless, that some previous enquiry, some deliberation would have been deemed requisite ; not that we should have been called at once without examination, and without cause, to pass sentences by wholesale, and sign death-warrants blindfold. But, admitting that these men had no cause of complaint ; that the grievances of them and their employers were alike groundless ; that they deserved the worst ; what inefficiency, what imbecility has been evinced in the method chosen to reduce them ! Why were the military called out to be made a mockery of, if they were to be called out at all ? As far as the differences of seasons would permit, they have merely parodied the summer campaign of Major Sturgeon ; and, indeed, the whole proceedings, civil and military, seemed on the model of those of the Mayor and Corporation of Garratt. Such marchings and counter marchings ! from Nottingham to Bulwell, from Bulwell to Basford, from Basford to Mansfield ! and when at length the detachments arrived at their destination, in all " the pride, pomp, and circumstance of glorious war," they came just in time to witness the mischief which had been done, and ascertain the escape of the perpetrators, to collect the " spolia opima " in the fragments of broken frames, and return to their quarters amidst the derision of old women, and the hootings of children.

Now, though in a free country, it were to be wished, that our military should never be too formidable, at least to ourselves, I cannot

see the policy of placing them in situations where they can only be made ridiculous. As the sword is the worst argument that can be used, so should it be the last. In this instance it has been the first; but providentially as yet only in the scabbard. The present measure will, indeed, pluck it from the sheath; yet had proper meetings been held in the earlier stages of these riots, had the grievances of these men and their masters (for they also had their grievances) been fairly weighed and justly examined, I do think that means might have been devised to restore these workmen to their avocations, and tranquillity to the county. At present the county suffers from the double infliction of an idle military and a starving population. In what state of apathy have we been plunged so long, that now for the first time the House has been officially apprized of these disturbances? All this has been transacting within 130 miles of London, and yet we, "good easy men, have deemed full sure our greatness was a ripening," and have sat down to enjoy our foreign triumphs in the midst of domestic calamity. But all the cities you have taken, all the armies which have retreated before your leaders are but paltry subjects of self congratulation, if your land divides against itself, and your dragoons and your executioners must be let loose against your fellow citizens.—You call these men a mob, desperate, dangerous, and ignorant; and seem to think that the only way to quiet the "*Belua multorum capitum*" is to lop off a few of its superfluous heads.—But even a mob may be better reduced to reason by a mixture of conciliation and firmness, than by additional irritation and redoubled penalties. Are we aware of our obligations to a mob? It is the mob that labour in your fields and serve in your houses, that man your navy, and recruit your army, that have enabled you to defy all the world, and can also defy you when neglect and calamity have driven them to despair. You may call the people a mob, but do not forget, that a mob too often speaks the sentiments of the people. And here I must remark with what alacrity you are accustomed to fly to the succour of your distressed allies, leaving the distressed of your own country to the care of Providence or—the Parish.

When the Portuguese suffered under the retreat of the French every arm was stretched out, every hand was opened, from the rich man's largess, to the widow's mite, all was bestowed to enable them to rebuild their villages and replenish their granaries. And at this moment, when thousands of misguided but most unfortunate fellow-countrymen are struggling with the extremes of hardships and hunger, as your charity began abroad it should end at home. A much less sum, a tithe of the bounty bestowed on Portugal, even if those men (which I cannot admit without enquiry) could not have been restored to their employ-

ments, would have rendered unnecessary the tender mercies of the bayonet and the gibbet. But doubtless our friends have too many foreign claims to admit a prospect of domestic relief ; though never did such objects demand it. I have traversed the seat of war in the peninsula, I have been in some of the most oppressed provinces of Turkey, but never under the most despotic of infidel governments did I behold such squalid wretchedness as I have seen since my return in the very heart of a Christian country. And what are your remedies ? After months of inaction and months of action worse than inactivity, at length comes forth the grand specific, the never failing nostrum of all state physicians, from the days of Draco to the present time.

After feeling the pulse and shaking the head over the patient, prescribing the usual course of warm water and bleeding, the warm water of your mawkish police, and the lancets of your military, these convulsions must terminate in death, the sure consummation of the prescriptions of all political Sangrados. Setting aside the palpable injustice and the certain inefficiency of the Bill, are there not capital punishments sufficient in your statutes ? Is there not blood enough upon your penal code, that more must be poured forth to ascend to Heaven and testify against you ? How will you carry the Bill into effect ? Can you commit a whole county to their own prisons ? Will you erect a gibbet in every field and hang up men like scarecrows ? or will you proceed (as you must to bring this measure into effect) by decimation ? place the county under martial law ? depopulate and lay waste all around you ? and restore Sherwood forest as an acceptable gift to the crown, in its former condition of a royal chase and an asylum for outlaws ? Are these the remedies for a starving and desperate populace ? Will the famished wretch who has braved your bayonets, be appalled by your gibbets ? When death is a relief, and the only relief it appears that you will afford him, will he be dragooned into tranquillity ? Will that which could not be effected by your grenadiers, be accomplished by your executioners ? If you proceed by the forms of law, where is your evidence ? Those who have refused to impeach their accomplices, when transportation only was the punishment, will hardly be tempted to witness against them when death is the penalty.

With all due deference to the noble lords opposite, I think a little investigation, some previous enquiry would induce even them to change their purpose. That most favourite state measure, so marvellously efficacious in many and recent instances, temporizing, would not be without its advantages in this. When a proposal is made to emancipate or relieve, you hesitate, you deliberate for years, you temporise and tamper with the minds of men ; but a death-bill must be passed off hand,

without a thought of the consequences. Sure I am from what I have heard, and from what I have seen, that to pass the Bill under all the existing circumstances, without enquiry, without deliberation, would only be to add injustice to irritation, and barbarity to neglect. The framers of such a Bill must be content to inherit the honours of that Athenian lawgiver whose edicts were said to be written not in ink but in blood. But suppose it passed ; suppose one of these men, as I have seen them,—meagre with famine, sullen with despair, careless of a life which your lordships are perhaps about to value at something less than the price of a stocking-frame—suppose this man surrounded by the children for whom he is unable to procure bread at the hazard of his existence, about to be torn for ever from a family which he lately supported in peaceful industry, and which it is not his fault that he can no longer so support, suppose this man, and there are ten thousand such from whom you may select your victims, dragged into court, to be tried for this new offence, by this new law ; still, there are two things wanting to convict and condemn him ; and these are, in my opinion,—Twelve Butchers for a Jury, and a Jeffreys for a Judge !

EMILIO CASTELAR

(1832-1899).

AS passionate oratory, harnessed to rhyme and lyric measure, characterizes so much of Byron's poetry, so do poetic feeling, imagery and modes of expression often make us hear a muffled tinkling of the lyre in the flow of Castelar's oratory. Fervid, sentimental, and florid, as his Spanish nativity presupposes, his poetic fancy asserts itself in his discussion of the most prosaic questions. But there is still enough of clear historic vision and grave reasoning to distinguish his statesman's mantle from the robes of the poet. As a Spanish Republican, striving earnestly to divorce his countrymen from monarchy and wed them to democracy, he led a tempestuous life. More than once he was a fugitive in exile, once, at least under sentence of death, yet once a cabinet minister, and at last President of a short-lived Spanish Republic.

He was born in Cadiz, September 8th, 1832, and became, when very young, the author of several novels and poems. He first distinguished himself politically by several stirring speeches at the Teatro del Oriente in Madrid against the misgovernment and vices of the court. He was made Professor of History and Philosophy in the University of Madrid in 1856, and by his lectures continued to increase his reputation. In 1864, he was deprived of his professorship on account of his connection with *La Democracia*, a journal established at that time under his direction. His connection with the disturbances of June 22nd, 1866, led to the suppression of his journal; he was sentenced to death, and had to remain in exile till the flight of the royal family enabled him to return in 1868 and resume the professorship which was offered to him again. He was one of the few Republicans elected to the Cortes in 1869, and became more celebrated than ever for the part he took in the debates; opposing a regency, opposing monarchy, and in vain advocating a Republican constitution. The monarchy of Amadeus, limited by extreme constitutional restrictions, owed the brevity of its existence largely to Castelar's opposition, and in the provisional Republic which succeeded he became, first, Minister of Foreign Affairs, and next, President of the Executive.

But the Republicans were divided, some advocating a "Unitary Republic" while Castelar and his wing demanded a "Federal Republic," "the United States of Spain" in "the United States of Europe," with an end of all wars. Insurrections in the Colonies and anarchy in Spain itself made a burden too heavy for Castelar's strength; and "between the red demagogy of the Communists and the white demagogy of the Carlists," he found the Cortes against him, and resigned in disgust, January 2nd, 1874. For some time he remained the leader of the moderate faction of the Republicans, but in 1875 he resigned his professorship and in 1893 announced his retirement from politics, despairing of the Republican cause in Spain and regretting that he had not supported the limited monarchy of 1869 as the best thing Spaniards of the nineteenth century were capable of appreciating.

Castelar is the author of a great number and variety of published books and of numerous lectures and speeches. He died May 25th, 1899.

A PLEA FOR THE UNITED STATES OF EUROPE

(Speech in the Spanish Assembly, December 18th, 1869).

BEFORE replying to Minister Sagasta's speech of last Saturday, I desire to say that my public life forbids me to defend myself against personal attacks such as the gentleman seems to delight in. The Minister of Government was extremely kind in speaking of my address as a brilliant one and extremely severe when he declared that it was wanting in truth. Neither criticism was just. Gentlemen, I would not have to defend my own speeches if they had the resplendency and the beauty attributed to them by Mr. Sagasta. I would be content to let them shine, confident, with the most eloquent and greatest of ancient philosophers, that "Beauty is the resplendency of Truth." After all, if there is any grand quality in this Assembly it is eloquence, the expressing of grand sentiments and sublime ideas in fervent language. I have heard such speeches come from every side of the Assembly and I would like to hear one, in the language of moderation, from the Government. Discussions carried on in that manner, with eloquence and good judgment, give us hope for the future, for the laws of history do not permit a dictatorship to fasten itself upon a people whose faces are lighted by the fires of eloquence,—a sure sign of grand apostolic work in social life.

I have said this, not being able to proceed without repelling a calumnious imputation directed against me by the Minister of Government.

To a question of Mr. Oria relative to an attack on property, the gentleman replied that it was the work of the Federalists. In what article, in what proclamation, in what programme, in what bulletin, in what periodical, in what speech of a Federalist has the gentleman discovered that we attack property? Against the robbers are the courts and the judges, and it is an imposition on the Assembly and a calumny on our social conditions to charge us with such crimes and to seek to spatter this minority with the mud that bespatters all of you. This is not just.

Now, I must answer with calmness another slanderous imputation. The Minister of Government says that the Federal Republican party desired the dismemberment, the dissolution, the breaking up of this country. A party that aspires to a European confederation, a party that desires to see the abominable word "war" abolished, a party that desires to unite disunited people cannot seek the dismemberment of a country bound together by tradition and law. We desire that from Barcelona to Lisbon, from Irun to Cadiz, there shall be but one flag—a flag, however, under whose folds the citizen may have freedom, the municipality autonomy, and the province rights that belong to the whole country.

The accusation of the gentleman reminds me of the one concerning decentralization made by the Moderate party against the Progressive party, and the claim of the Moderates that with decentralization national unity was impossible. Notwithstanding this claim, it is generally believed to-day that people who suffer most in their independence have a centralized government, because it is enough to aim a blow at their head, like the blow aimed by the allied powers in Paris in 1815. The belief is general that those nations that have great internal dissensions are centralized nations, because they have an apoplectic head on a weak, stiff body. And so I say that, as centralization is believed in to-day, federation will be to-morrow—a federation the belief in which will result sooner or later in the organization of the United States of Spain within the United States of Europe.

Mr. Sagasta began to defend the dictatorship, and in defending it he drew an awful picture of our social condition, talking of crimes and criminals, and telling you that our education in the past was very bad, and that the corruption of to-day is very great. And what have the Republicans to see from that? For three centuries, yes, more than three centuries, our Church has been as an enemy to the human conscience. For many centuries it has been inimical to the national will. Consequently, if there is anything very bad or vicious here to-day, it is owing to institutions with which we have nothing to do. And more, this evil, this viciousness, owe their existence to a lack of respect among the people for the

law. And this lack of respect for the law is born of the systematic abuse of power by our arbitrary government. Judges nominated by a party and appointed to revise the electoral lists; schools so called, for filling convents and military barracks; the jury outlawed; public life closed to the democracy; political corruption extending from above down in all directions—this is the product, and these the products, of the sore and wounded people painted by Mr. Sagasta: people who are the natural offspring of a long heredity of crime and error. It is impossible to cure the people if the system is not changed. . . .

Well, what form of government has come to Spain since the September revolution? The republican form has come and is still here. It so happens, that you have not been able yet to implant monarchical institution in its place. After having been fifteen days in power you declared yourselves for the monarchy. Did the monarchy come? After the elections you declared yourselves monarchists and us outlaws. Did you create the monarchy in the primaries? When the assembly convened, the monarchy was proposed; there we have had great battles. Has the monarchy been established? The Conservatives although they have not said so, have, I believe, agreed upon a candidate; the Radicals, more loquacious, have told us theirs; but have you, separated or united, produced a monarchy?

The Conservatives have a candidate who really represents the latest privilege granted the middle classes. Why is it that they do not bring him here? Because they know that this is a democratic monarchy, based, as it is supposedly, on universal suffrage, and because the candidate has not, never had, and never will have, the votes, the indorsement, the backing of the people. And you? You want a monarchy to keep up appearances, a monarchy in order that Europe may say, "See how prudent, how God-fearing, how wise, how intelligent are the Spaniards; they have a disguised republic!" After a provisional government and a provisional regency you want a provisional monarchy also. You do not expect or want to be strong in the right, in liberty, in the will of the people or in national sovereignty. All you want is a king who shall represent the predominance and the egotism of a party. You ought to know that as the candidate of the Conservatives cannot come here without the consent of the people your candidate cannot come without the consent of the Conservatives. Do you believe that your candidate will last if all the Conservative forces do not support him? Notwithstanding all that the Conservatives have declared to their representatives here, not one of them has said that he renounces his dynastic faith. Therefore, you cannot establish the monarchy.

On Saturday I pictured to you, in colours more or less vivid, the prestige which monarchical institutions have enjoyed in our country, and for this the Minister of State upbraided me without understanding my arguments. I ask you to concentrate your attention for a moment upon the parallel which I am going to present and which may be called a summary of this speech. I said the other afternoon, that to establish monarchical institutions it was necessary to possess monarchical faith and sentiment. One must have the poetry and the traditions of monarchy. I said this because I know that, although the assembly and the official authorities can make laws, they cannot decree ideas or sentiments, those real and solid foundations of institutions. Formerly, in other times, kings were representative of the national dignity, and now from those same benches we have heard that they sold their native soil to a foreigner and even prostrated themselves at his feet, the people in the meantime answering the enemy with the second of May and the siege of Saragossa. Formerly poetry, addressing the throne, exclaimed :—

“ Oh ! what a profound abyss
Of iniquity and malice
The mighty of the world
Have made of your justice ! ”

Formerly art sketched the apotheosis of Charles V. with Titian's brush, or the ladies-in-waiting of Philip IV. with the brush of Velasquez ; now it sketches the image of the communists, of the victims of Charles V., or the ship in which the Puritans took the republic to the bosom of virgin America. Formerly, the gala days of the people were the birth-days of kings and the anniversaries of the beginning of their reigns. Now, the great days of celebration are the tenth of August, the thirtieth of July, the twenty-fourth of February, and the twenty-ninth of September, days marking the expulsion of kings. Formerly, when a navigator landed in America, or an explorer went into the interior of a new country, the purest piece of gold, the largest pearl, the clearest diamond was reserved for the king. Now, your Minister of the Treasury claims from the king even the clasp which holds the royal mantle about his shoulders. I will not continue this parallel as the Chamber clearly sees the application.

What does this mean ? What does it signify ? If the throne has fallen, if the throne is broken, if the throne is dishonoured, if the throne cannot be restored, Conservatives, Unionists, Progressives, Democrats, repeat with the poet :—

“ Mankind, weep ;
All of you laid your hands on him.”

As there is no possibility of establishing the monarchy, as no candidate acceptable to all can be found, it is necessary, it is indispensable to get rid of the suspense, and I say that we should establish a republic. Have you not said that the forms of government are accidental? Gentlemen, you know the republic I want. It is a federal republic. I shall always defend the federal republic. I am a Federal, but, understand one thing, the republic is a form of government which admits many conditions, and which has many grades. From the republic of Venice to that of Switzerland there is an immense scale. Adjoining Mexico, where Church and State are separated, there is Guatemala, where the clergy have great power. Close to the decentralized and federal Argentine Republic is the Chilian Republic, another decentralized country enjoying great prosperity, its paper money being quoted in all the markets of Europe as high as that of England. Consequently, amidst this great affliction and this great trouble and this unstable equilibrium, which surrounds you, you can establish a form of government which is of the people and for the people, a form of government in harmony with the institutions you have proclaimed, and with the sentiments which all of you guard in the bottom of your hearts.

Have you not seen in history the inability of an assembly or any power to establish a form of government in conflict with great ideas? Remember the eighteenth century. Never had a monarchy attained more power, never was absolutism so strong, never was the destruction of obstacles in the way of kings more complete. Philosophy ascended the throne with them, ascended with Charles III. and Aranda and Tombal. It ascended with Joseph I., with Frederick the Great, with Leopold of Tuscany. All seemed to conspire to establish the same idea, the idea of a philosophy and a liberalism. And did they succeed? No, they were the Baptists of the Revolution. They repented late and the philosophy they had thrown at the feet of the thrones came to naught. And what happened? Some were sentenced by the Assembly. The crowns of divine rights were melted into cannon balls by the soldiers of the Revolution. What does this signify? That great powers cannot place absolutism above philosophy any more than you can build monarchical institutions on individual rights. Therefore, I beseech you to establish the republic. You are assured of our patriotism, our great interest in the country, our abnegation. Cato committed suicide because he found a Cæsar. Radicals of Spain, do not commit suicide because you cannot find a monarch. I have spoken.

JOSEPH CHAMBERLAIN

(1836-1914).

JOSEPH CHAMBERLAIN was born in London in the month of July 1836, and was educated at University College School. His education finished, he removed to Birmingham, the city with which his name and work were identified until the day of his death.

Entering into municipal politics, his abundant energy and ability soon brought him to the front, and he became in turn, Chairman of the Birmingham Educational Board, President of the School of Design ; and finally Mayor. Whilst holding the office of Mayor of Birmingham, he instigated schemes of municipal reform of such a drastic character that the city debt was increased from one to eight millions in a couple of years. Though staid and conservative financiers stood aghast, his schemes have stood the test of time, and the people of Birmingham were never tired of acknowledging his good influence. His municipal activity alone was sufficient to make an ordinary man notable.

In the year 1876, he began his long career as Member for West Birmingham, which he continued to represent until his death.

In the House of Commons, his power of grasping the essentials of a subject and of presenting them with a vigorous clarity, soon brought him to the front ; and the hall-mark of official leadership was conferred upon him by his appointment as President of the Board of Trade under the Liberals during 1880-85.

About this time he formulated his political creed, to which, it may be added, he adhered in essentials during the whole of his political career :—
 “ I am confident in the capacity of a wise government resting upon the representation of the whole people, to do much to add to the sum of human happiness, and to smooth the way for poverty and misfortune.”
 This was Joseph Chamberlain's belief and this will afford a clue that will serve as guide to a career, that to the superficial observer, appears full of inconsistencies. “ It is not I,” he said once “ who change ; but circumstances.”

The next step in his career was taken when he became President of the Local Government Board in 1886, but he resigned this office on the split over the Gladstonian Home Rule Bill. After the defeat of the Liberals, Lord Salisbury became Premier and offered Chamberlain

the important post of Secretary of State for the Colonies. His acceptance of this office marked the parting of the ways ; and inaugurated the cult of Imperialism and the State policy of " Tightening the Ties," between the Colonies and the Mother Country.

The Boer War brought down a storm of criticism upon his head, but he defended himself by some shrewd thrusts. In the Autumn Session of 1899, he said " President Kruger has settled the issue. He has appealed to the God of Battles, and in all reverence we accept the appeal, believing we have our quarrel just."

After the war came the era of Tariff Reform and a speech outlining that policy, was made in May, 1903.

The strenuous and splendid career was now drawing to a close ; and soon after his 70th birthday his health suddenly gave way, and the few remaining years were passed in complete retirement. He died July, 1914.

EMPIRE AND HOME RULE

(Delivered before a Meeting of the Unionists of West Birmingham,
May 15th, 1903).

THERE must be ups and downs in politics. I have had now a long experience, and I will safely predict of any government that, if it endeavours honestly to grapple with the great problems of its time, it will lose a certain amount of support. . . . Under ordinary circumstances, the business of a government is to spend itself in doing what it thinks to be right. There comes a time when it has spent all that it has ; and then it makes room for its successor. And let me say in all seriousness that, if I were assured that the main lines of our Imperial and National policy, those things which touch our existence, were secured, if I could feel that there was that continuity in foreign and Colonial policy which I have known to exist in past times, I for one should be very willing, indeed, to allow to my political opponents their chance in their turn to try their hands at the difficult domestic problems with which we have had to deal. . . . But, gentlemen, what do I want in order to face the future not only without regret, but with absolute relief and rejoicing ? I want to know that the party which would take our place has frankly abandoned that disastrous policy of Home Rule which would begin with the disruption of the United Kingdom, and which would end in the disruption of the Empire. For, believe me, it is borne in upon me now more than ever—you cannot weaken the centre without destroying

all that depends upon the centre. If you want an Empire you must be strong and united at home. If separation begins here, take my word for it, it will not stop here. The Empire itself will be dissolved into its component atoms. If I could believe, however, that our opponents had frankly abandoned Home Rule—if Sir Henry Campbell-Bannerman, as the leader of the party, should divest himself of the curious antagonism to everything British which makes him the friend of every country but his own; if I thought that his followers were animated by that broader patriotism by which alone our Empire can be held together—then, indeed, I would be the first to sing *Nunc Dimittis*. . . .

I did not require to go to South Africa in order to be convinced that this feeling has obtained deep hold on the minds and hearts of our children beyond the seas. It has had a hard life of it. This feeling of Imperial patriotism was checked for a generation by the apathy and the indifference which were the characteristics of our former relations with our Colonies. It was discouraged by our apparent acceptance of the doctrines of the Little-Englanders, of the provincial spirit which taught us to consider ourselves alone, and to regard with indifference all that concerned those, however loyal they might be, who left these shores in order to go to our Colonies abroad. But it was never extinguished. The embers are still alight, and when in the late war, this old country of ours showed that it was still possessed by the spirit of our ancestors, that it was still prepared to count no sacrifice that was necessary in order to maintain the honour and the interests of the Empire that was committed to its charge, then you found such a response from your brethren, your children, across the seas, as had never been known before, astonishing the world by an undeniable proof of affection and regard. I have said that that was a new chapter, the beginning of a new era. Is it to end there? Is it to end with the end of the war, with the termination of the crisis that brought it forth? Are we to sink back to the old policy of selfish isolation which went very far to try, and even to sap, the loyalty of our Colonial brethren? I do not think so, I think these larger issues touch the people of this country. I think they have awakened to the enormous importance of a creative time like the present, and will take advantage of the opportunity that is offered to make permanent that which has begun so well. Remember, we are an old country. We proceed here upon settled lines. We have our quarrels and our disputes, and we pass legislation which may be good or bad, but which at any rate, can be altered. But we go towards an object which is sufficiently defined. We know that, whatever changes there may be—whatever meandering of the current—at all events the main stream will ultimately reach its appointed destination. This is the result of centuries of con-

stitutional progress and freedom. But the Empire is not old. The Empire is new. The Empire is in its infancy. Now is the time when we can mould that Empire, and we and those who live with us can decide its future destinies.

Here, in the United Kingdom, there are some forty millions of us. Outside there are ten millions either directly descended from ancestors who left this country, or persons who themselves, in their youth, left this country in order to find their fortunes in our possessions abroad. Now, how long do you suppose that this proportion of the population is going to endure? How long are we going to be four times as many as our kinsfolk abroad? The development of those Colonies has been delayed by many reasons—partly, as I think, by our inaction, partly by the provincial spirit which we have not done enough to discourage, that spirit which attaches undue importance to the local incidents and legislation of each separate State, and gives insufficient regard to the interests of the whole, but mainly, probably, by a more material reason, by the fact that the United States of America have offered a greater attraction to British immigration. But that is changing. The United States of America, with all their vast territory, are filling up, and even now we hear of thousands and tens of thousands of emigrants leaving the United States of America in order to take up the fresh and rich lands of our Dominion of Canada. And it seems to me to be not at all an impossible assumption that, before the end of this present century, we may find that our fellow-subjects beyond the seas may be more numerous than we are at home.

I want you to look forward. I want you to consider the infinite importance of this, not only to yourselves, but to your descendants. Now is the time when you can exert influence. Do you wish that, if these ten millions become forty millions, they shall still be closely, intimately, affectionately united to you? Or do you contemplate the possibility of their being separated going off each in his own direction under a separate flag? Think what it means to your power and influence as a country; think what it means to your position among the nations of the world; think what it means to your trade and commerce. I put that last. The influence of the Empire is the thing I think most about, and that influence, I believe, will always be used for the peace and civilization of the world. . . .

Canada is the greatest, the most prosperous, of our self-governing Colonies. At the present time it is in the full swing of an extraordinary prosperity, which I hope and believe will lead to a great increase in its population, its strength, its importance in the constellation of free nations which constitutes the British Empire. Canada is, of all

our Colonies, the most backward in contributing to common defence, but Canada has been the most forward in endeavouring to unite the Empire by other means—by strengthening our commercial relations, and by giving to us special favour and preference. And if we appreciate this action properly, it seems to me that not only is it certain that every other Colony of the Empire will necessarily and in due time follow this example, but Canada herself and the other Colonies, as the bonds are drawn closer, and as we become more and more one people, united by interest as well as by sentiment, will be more and more ready to take their fair share in these burdens of defence to which I have referred. The policy which I wish to make clear to you is not to force our Colonies—that is hopeless, for they are as independent as we are—but to meet everything they do. If they see a way of drawing the Empire together, let us help them in that, even if they may not be prepared to join us in some other way from which we think the same result would be achieved. But let us be prepared to accept every indication on their part of this desire. Let us show we appreciate it ; and, believe me, it will not be long before all will come into line ; and the results which follow will be greater than, perhaps, it would be prudent now to anticipate. . . .

Well, ladies and gentlemen, you see the point. You want an Empire. Do you think it better to cultivate the trade with your own people, or to let that go in order that you may keep the trade of those who are your competitors and rivals ? I say it is a new position ; I say the people of this Empire have got to consider it. I do not want to hasten their decision. They have two alternatives before them. They may maintain, if they like, in all its severity, the interpretation—in my mind an entirely artificial and wrong interpretation—which has been placed upon the doctrines of Free Trade by a small remnant of Little Englanders of the Manchester School, who now profess to be the sole repositories of the doctrines of Mr. Cobden and Mr. Bright. They may maintain that policy in all its severity, although it is repudiated by every other nation, and by all your own Colonies. In that case, they will be absolutely precluded, either from giving any kind of preference or favour to any of their Colonies abroad, or even from protecting their Colonies abroad when they offer to favour us. That is the first alternative. The second alternative is that we should insist that we will not be bound by any purely technical definition of Free Trade ; that while we seek as our chief object free interchange of trade and commerce between ourselves and all the nations of the world, we will, nevertheless, recover our freedom, resume the power of negotiation, and, if necessary, retaliation, whenever our own interests or our relations between our Colonies and ourselves are threatened by other people.

THE MEGAPHONE AND MANHOOD SUFFRAGE

(Delivered at the Bright Celebration in Birmingham, June 13th, 1883).

AMONG the numerous discoveries which we owe to science, I was much interested some time ago in reading of one which I think was called the megaphone. Its province was to expand and develop the sounds which were entrusted to it. By its means a whisper becomes a roar. Well, at every general election you hear the roar of the parliamentary representative system, and some people are deceived ; they think it the thunderous voice of the people to which they are listening. But if they would only trace it to its source they would find it was the whisper of some few privileged individuals swollen and expanded by the ingenious political megaphones which I have described to you. Do you wonder that in an arrangement like this every vested interest, every timeworn privilege, every ancient abuse, finds its account ?

“ Now an't this a system worth pains in presarving ?

“ When people finds joints and their friends does the carving.”

I say it is time to make an effort to put the representation of the people upon a purer basis and safer foundation. How shall we put the dots on the *i*'s ? What do we want ?

We want, in the first place, a suffrage from which no man who is not disqualified by crime, or the receipt of relief, who is expected to fulfil the obligations of a citizen, shall be excluded. We want equal electoral districts, in order that every vote may have an equal value, and we want, I think, the payment of members, in order that every man who has the capacity to serve his country, who has honesty, intelligence, and who is selected for that purpose by his fellow-countrymen shall not be excluded for want of means. That is what we want ; what we shall get is another matter.

MARQUESS OF CREWE, (ROBERT ASHBURTON CREWE-MILNES)

(1858-).

HE is a son of Lord Houghton, a noted writer and politician, and was born in London, January 1858. He passed through the Public School and University training common to his class, at Harrow and Trinity College, Cambridge. Developing an hereditary aptitude for a political career, he was appointed in 1883, to the post of assistant private secretary to Earl Granville, at that time Secretary for Foreign Affairs.

During 1892-95, he was Lord-Lieutenant for Ireland; and Lord President of the Council 1905-8; 1908-10 he was Secretary of State for the Colonies; in 1910 Secretary of State for India, and in 1917, Chairman of the London County Council. In 1922 he became Ambassador in Paris.

A natural book-lover, he rejoices in a library of over 35,000 volumes, and his collection of autograph letters is also a fine one. He writes both prose and verse: the former chiefly in the shape of articles on Ireland.

INDIAN EMIGRATION

(Speech delivered at the Imperial Conference, June 19th, 1911).

MR. HARCOURT (Chairman), I understand it is desired that at the beginning of the proceedings I should make a few general observations, as to the principles upon which this question of Indian emigration and immigration into the Dominions is founded. Perhaps I may begin by asking for some measure of indulgence from the Conference, because I have been away from my work for some time owing to an illness from which I am happy to say I am beginning to recover, but which has laid me by for some little time. I may, therefore, I am sure, claim the indulgence of the members of the Conference.

It so happens that I have had the advantage or the disadvantage, as the case may be, of having observed this question from two different standpoints; first, for some years when I held the office which Mr. Harcourt now holds, and since then as Secretary of State for India. In

both offices I have reached the conclusion that there is no question which could be discussed at this Conference more difficult, or I might even, I think, venture to say in some of its aspects, more critical than this question of Indian immigration, and the treatment of those of the Indian races, or indeed of any foreign native race who find themselves within the various self-governing Dominions.

I remember some years ago making a speech at a large Colonial dinner, in which I enforced that view, and went so far as to say (if I remember aright) that if there was any question which seemed to threaten not merely the well-being, but the actual existence, of the Empire as an Empire, it was this difficulty between the white races and the native races, because, I ventured to point out, as between the Dominions and the Mother Country there could be no question, whether it was a question of commerce or a question of defence or any other of the questions which we now discuss, which could not be solved by goodwill and by good sense on both sides. But this particular question, especially as regards India, is in one sense insoluble: there is no complete and perfect solution of this difficulty between the white races and the various native races. Now, I understand that this memorandum which I have before me has been circulated to all the members of the Conference, and those who have read it will recognise that it deals both with the general principles of the question, and also with special instances of difficulty which have arisen in the various Dominions with regard either to the ingress of Indians or to the treatment of Indians when they are there. In my present remarks I propose to confine myself entirely to the first branch, namely, to the question of the principles, because the particular instances involved are more matters for the special Department involved either here or in the Dominions themselves, and from that point of view they are less suitable, perhaps, for such general discussion as takes place here as being more of a domestic character.

Now I desire to say first, that I fully recognise—as His Majesty's Government fully recognise—two facts: the first is, that as the Empire is constituted, the idea that it is possible to have an absolutely free interchange between all individuals who are subjects of the Crown—that is to say, that every subject of the King whoever he may be or wherever he may live has a natural right to travel or still more to settle in any part of the Empire—is a view which we fully admit, and I fully admit, as representing the India Office, to be one which cannot be maintained. As the Empire is constituted it is still impossible that we can have a free coming and going of all the subjects of the King throughout all parts of the Empire. Or to put the thing in another

way, nobody can attempt to dispute the right of the self-governing Dominions to decide for themselves whom, in each case, they will admit as citizens of their respective Dominions.

That is one of the facts which on behalf of His Majesty's Government I fully recognise. I also recognise this—that we are or may be easily prone in this country to underrate the difficulties which confront the Dominions in this matter, because we are not troubled to any extent by a similar problem here. It so happens that there never has been any influx of coloured races into this country on a scale which has awakened any of the difficulties, which, as I well know, confront you gentlemen in the different self-governing Dominions. From one point of view, of course, it is an advantage to an Englishman, because he is able to take an impartial view, but at the same time it may lead him—as I indicated at first—not to attach sufficient weight to the very real and undoubted difficulties which you have to encounter in settling these questions.

As regards the whole question of Indian immigration, the Dominions feel, as I understand, two separate but at the same time closely interwoven objections to the influx of a large native population into their areas. In the first place such an influx may mean, and in practice often has meant, the rivalry of cheap labour. Now this is an entirely separate difficulty from the racial difficulty to which I shall allude in a moment ; but it is, of course, a very real difficulty and it is accentuated by the abandonment which we now see on the part of many, of some of the old theories of political economy. Many have now abandoned, for instance, the theory that labour can be regulated simply by the conditions of supply and demand. There are many nowadays, too, who have abandoned the theory that the remuneration of labour need necessarily stand in any very close relation to the value of the work done, and that being so, it is clear that the rivalry of cheap labour such as may be introduced from India seems a greater hardship than it did in the days of a harsher political economy which was generally accepted in Great Britain, and more or less all over the world, during the greater part of the nineteenth century. Now this labour objection would apply, and indeed in some parts of the world has applied, equally to the influx of any kind of labour depending on a lower standard of comfort whatever its colour may be, whether it be white or whether it be brown or black ; and all over the world we are certainly approaching, if we have not already arrived at, the time when organized labour will seriously object to the importation of any kind of lower paid labour, whatever its colour and whatever its nationality if it is a competitive character. This is one of the main difficulties, indeed, which is connected with

this question of Indian immigration. It is quite separate from and ought not to be in any way confused with the question of what we call the colour bar. The two are often intermixed and sometimes I think objections which are really founded on one are made to rest upon the other. But as to the existence of the colour difficulty in its crudest form there can, of course, be no question whatever.

This question of colour affects individuals in this country, and I have no doubt the same applies to all the Dominions in a very varying degree. Some people feel a natural sympathy and kindness towards the men of a coloured race. On the other hand other men, very often equally humane and with as high an ethical standard as the others, feel an instinctive distaste or even dislike to men of a different race. That is a matter which cannot be argued upon, but it is an undoubted fact, partly, I daresay, physiological as well as mental. Now certainly I am not at all disposed to underrate the objections of a certain kind which are felt by many to a close intercourse, between the white and the coloured races. If we consider, for instance, the question of marriage, the question of intermarriage between races is one which is so far singular in its application to this subject that the disapproval of marriage of a white man with a native woman, and still more the marriage between a white woman and a man of a native race, affects superior people to the greatest extent. It is one of those prejudices or beliefs which becomes stronger as people become more educated and more generally superior, and in this respect it differs from most of the easy and foolish prejudices which are held against the native races. I am disposed to go so far as to say that in most respects the less a white man has individually to be proud of, the prouder he is apt to be of his whiteness, and the more he considers himself entitled to look down upon people of a coloured race. So far as my travels about the world, which have not been inconsiderable, have led me to suppose, I should certainly go so far as to say that there is no man who is more convinced of his superiority to the members of the native races, however cultured or however superior in other respects they may be, than the mere bar-loafer whose mental horizon is habitually clouded by whisky.

Now there is no doubt, I think, that our national British traits lead us into some temptation and difficulty in this matter. I remember hearing of a witty observation made many years ago, which was to the effect that a Frenchman begins by having a good opinion of himself, but an Englishman begins by having a bad opinion of other people. I do not know whether Sir Wilfrid, who knows both races so well, would be disposed in any way to confirm that statement; but that being so, if it is so, shows, I think, what our national temptations are when we

come to consider the claims and the merits of people of a race entirely different from our own. What those claims and merits are are set out in the words which are quoted on the first page of this memorandum which has been circulated, among the observations made by Mr. Chamberlain in his address to the Conference in 1897. Those words are, if I may venture to say so, well worth weighing. I will not attempt to enlarge upon or in any way develop what Mr. Chamberlain there so admirably said. I might, however, venture perhaps to remind you that, on the point of the national claims of Indians grounded on their past history—on their long descent—and other questions of the kind, this at any rate is not a moment when we desire to ignore those considerations. The ceremony of Thursday next, to which we are all looking forward, depends to a great extent for its meaning upon the long line of British sovereigns, through the Stuart, Tudor, and Plantagenet dynasties back to the time of the Norman Conquest and the dim ages of the Saxon Monarchy; and yet there are to be found in India those whose pride of descent is no less well founded and no less real than that of the King of England himself. Then, again, as regards history, we must never forget that not merely has India produced a great number of remarkable men both in the public service, and, to go back further, notable in ancient literature, but that she is most closely linked to a great number of the most famous men of our own race—statesmen, soldiers and others. Now, of course, these considerations do not appeal to everybody. We know very well there is a large number of persons to whom the particular appeal of history and tradition does not come home; but on the eve of the Coronation I can hardly help alluding to this particular aspect of the question. But when you pass on to personal qualities in order to decide whether a man possesses a claim for consideration, really I think the case for those who object to Indians as Indians is worse still. If “A man’s a man for a’ that” is to be our motto, the claim of a large number of Indians is a real and solid claim indeed. Whether we value intellectual culture, whether—apart from questions of creed—we value the religious mind, whether we value that remarkable devotion to and understanding of the things which are not seen which is so exceptionally deep in India and which, I think, appeals to many people in these harder and material days—whether, again, we value simple intellectual force, uncertain in its exercise in some directions I admit, but which in others produces as keen and fine an instrument as you can find in any part of the world—whether we value all of those things or any of them it is undoubtedly the fact that India and Indians can establish a high and real claim for our consideration, apart from all others.

I may again venture to remind the Conference, in spite of certain facts and certain difficulties which have arisen within the last few years, of the undoubted and signal loyalty of the Indian races as a whole to the British connection and especially to the British Crown. As things are, I fully admit that there is no short cut to the solution, so far as I know, in any part of the self-governing Dominions, of this question of Indian immigration by the adoption of heroic legislation—that I fully admit. But I do submit with confidence to the Conference that the relations between India and the rest of the Empire may be most materially improved by the cultivation of a mutual understanding. So far as the Indian standpoint is concerned, I quite admit that India must admit the main postulates with which I opened these observations, that is to say the undoubted liberty of the self-governing Dominions to lay down the rules of their own citizenship, and I can say cheerfully on behalf of the India Office and the Government of India that we will always do our best to explain to the people of India how the position stands in this matter. We will not encourage India in any way to develop what, as circumstances are, can only be called extravagant claims for entrance into the self-governing Dominions, and we will do our best to explain to them what the conditions of the Empire really are. In turn I think we are entitled and indeed it is our duty to ask the Ministers of the self-governing Dominions to spread within their own area in each case a realization of how deep and how widespread feeling on this subject in India is. As I think the memorandum points out, the question is an unique one in this—that it combines all sections and shades of Indian opinion—all classes and all creeds and political schools—those who are most devoted to the British Crown, and those—few in number, as I hope and believe, but sometimes noisy and sometimes in their way even formidable—who desire to see the end of British rule in India—all these combine when it is a question of Indian disability in any part of the British Empire. It cannot be denied that this difficulty is a very real asset, and a valuable asset, in India to those who are opposed to our rule there. This is an aspect which I venture to impress strongly on the Conference. It puts into the hands of those—some of them entirely unscrupulous people—who object to our presence in India and who desire to undermine the Government, a weapon which they are not slow to use in attacking us. If, they ask, Indians are to suffer from disabilities in various parts of the Empire, what good is the British connection at all? Of course, it is a question which can very easily be answered, at any rate to a great extent, but put in that form it naturally makes an appeal to people who are not well informed. I may point out also that the growing tendency to apply principles of

self-government to India adds greatly to the complication and difficulty of the matter, because when a legislative council, as always possibly may happen, takes occasion to make a particular protest against some legislation or some administrative act on the part of the Government of a Dominion, it becomes—as I am sure you will all be disposed to agree—a far more serious matter than if a mere uninformed grumble, perhaps in the press or elsewhere, is heard. Therefore, the further we go towards developing the power of India to govern herself the greater are the difficulties which arise on this particular question.

What I should venture to state as the lines upon which the Dominion Governments might respectively proceed involve these two considerations. I think that it is possible for the Dominion Governments, strictly within the limits which they lay down for the admission of Indians, to make the entrance of Indians more easy and more pleasant than it has been in the past. It is a matter, I have no doubt, involving some personal trouble, but I am quite certain that if it could become known that, strictly within those limits which we all agree you are entitled to exercise, the Indian subjects of the Crown will receive a real welcome when they come and will not be looked upon with distrust or suspicion, much might be done to better the relations between India and the Dominions. On the other side, as regards the protection of those who are already domiciled there, some, I may remind you, have been there for a very long time indeed. There is at any rate one of the Dominions in which Orientals have been domiciled for some 200 years.

You know very well the matters to which Indians who are in a Dominion attach special importance. In some cases, although not in all, they attach the highest importance to the maintenance of the obligations of caste, and I should hope, therefore, that so far as possible, particularly when Indians are unlucky enough to get into trouble and have to go to prison either for offences against the criminal law or on account of resistance to regulations having the force of law, so far as possible every effort will be made to consider the force of the caste prejudices and similar prejudices which Indians possess, and to make matters as easy for them as possible in that respect.

So far as my experience goes, Ministers have shown every desire in every case in which we have appealed to them on the subject to act not merely with humanity (I am speaking, of course, of the Dominion Ministers), but in a broad-minded spirit on these questions. The difficulty, of course, does not arise, I know very well, from the views or prejudices of Ministers themselves, but it cannot always be easy for

them to impress upon their subordinates, quite subordinate officials who are probably imbued with a very strong anti-colour prejudice, the importance which we attach, and which those who have to do with India and know India always attach—to what may seem small matters of this kind. I am quite certain that I may venture to appeal to the Dominion Ministers to do all they can to inform public opinion rationally on the points that I have ventured to allude to in the earlier part of my remarks of the general claims of Indians—the members of another race—to considerate and friendly treatment as fellow-subjects and, as we hope in most cases, loyal subjects of the Crown. I think it cannot be disputed that until fairly pleasant terms exist between the self-governing Dominions and India, within, of course, I repeat once more, the necessary limitations which arise from the fact that you are self-governing Dominions, it cannot be denied that we are far from being a united Empire ; however close the connection and however perfect the understanding between the Mother Country and the self-governing Dominions, we are not a united Empire unless that understanding spreads to some considerable extent also to that vast part of the Empire of which, of course, India is the most prominent division, but which also includes all the Crown Colonies which are inhabited by the various native races. We cannot be a united Empire for two reasons : in the first place, you cannot properly speak of a united Empire so long as acute and active difficulties exist between the different parts composing that Empire, and secondly—this, I am sure, will appeal to Ministers here—it is a distinct misfortune and a derogation from the unity of the Empire if the Mother Country continually finds itself implicated in difficulties between various parts of the Empire. I think it is one of the least agreeable functions which Mr. Harcourt and the members of the Government generally can have to fulfil, to be appealed to from one part of the Empire to another on matters of the kind which I have indicated ; and it is for that reason that we should like to institute, if possible, a first-hand understanding between the Dominions and India—a direct understanding between your Governments and the Government of India—without the necessity for our acting either as advocates on the one side or the other, or being called in to give an opinion.

I think that is all I have to trouble you with. I have confined myself purposely to general propositions, because this is really a matter very much more of the spirit and attitude which you can take up than of an attempt to deal with the question by a series of legislative propositions. I do not pretend, as I repeat once more, that the question is really a soluble one in the full sense—I do not think it is, but I am quite certain that if the Dominions will agree all through to show an

accommodating and friendly spirit towards India, although there will be, I have no doubt, plenty of unreasonable people in India as there are everywhere, yet at the same time the best public opinion in India will recognise your efforts and will endeavour to play its part in a peaceful solution of any difficulties as they may arise.

SIR WILLIAM CROOKES

(1832-1919).

FAMOUS in the science of the Nineteenth Century, Sir William Crookes became not only more famous but popular throughout the English-speaking world, as a leader of what has been called the "New Thought" of the Twentieth Century. Born June 17th, 1832, and educated in science at the Royal College of Chemistry, he became Professor of Chemistry in the Training College, Chester, in 1855. In 1861, he announced the discovery of thallium as the first of the series of remarkable achievements which included the spinthariscopes and the radiometer. He was knighted in 1897 and chosen President of the British Association for the Advancement of Science in 1898. His strong constructive imagination and his power as a public speaker, notable in the field of science, would have made him a success in any field of oratory.

THE REALIZATION OF A DREAM

(An Address delivered before the Congress of Applied Chemistry, at Berlin, June 5th, 1903).

THE now generally accepted view that our chemical elements have been formed from one primordial substance was advocated in 1888 by me when President of the Chemical Society, in connection with a theory of the Genesis of the Elements. I spoke of "an infinite number of immeasurably small, ultimate—or, rather, ultimatissimate—particles gradually accreting out of the formless mist, and moving with inconceivable velocity in all directions."

Pondering on some of the properties of the rare elements, I strove to show that the elementary atoms themselves might not be the same now as when first generated—that the primary motions which constitute the existence of the atom might slowly be changing and even the secondary motions which produce all the effects we can observe—heat, chemic, electric and so forth—might in a slight degree be affected; and I showed the probability that the atoms of the chemical elements were not eternal in existence, but shared with the rest of creation the attributes of decay and death.

The same idea was expanded at a lecture I delivered at the Royal Institution in 1887, when it was suggested that the atomic weights were not invariable quantities.

I might quote Mr. Herbert Spencer, Sir Benjamin Brodie, Professor Graham, Sir George Stokes, Sir William Thomson (now Lord Kelvin), Sir Norman Lockyer, Dr. Gladstone, and many other English *savants* to show that the notion—not necessarily of the decomposability, but, at any rate, of the complexity, of our supposed elements—has long been “in the air” of science, waiting to take more definite development. Our minds are gradually getting accustomed to the idea of the genesis of the elements, and many of us are straining for the first glimpse of the resolution of the chemical atom. We are eager to enter the portal of the mysterious region too readily ticketed “Unknown and Unknowable.” Another phase of the dream now demands attention. I come to the earlier glimpses of the electric theory of matter. Passing over the vaguer speculations of Faraday and the more positive speculations of Sir William Thomson, one of the earliest definite statements of this theory is given in an article in the *Fortnightly Review* for June, 1875, by W. K. Clifford—a man who in common with other pioneers shared that “noblest misfortune of being born before his time.” “There is great reason to believe,” said Clifford, “that every material atom carries upon it a small electric current, *if it does not wholly consist of this current.*”

In 1886, when president of the Chemical Section of the British Association, in a speculation of the origin of matter, I drew a picture of the gradual formation of the chemical elements by the workings of three forms of energy—electricity, chemism, and temperature—on the “formless mist” (protyle), wherein all matter was in the preatomic state—potential rather than actual. In this scheme the chemical elements owe their stability to their being the outcome of a struggle for existence—a Darwinian development by chemical evolution—a survival of the most stable. Those of lowest atomic weight would first be formed, then those of intermediate weight, and finally the elements having the highest atomic weights, such as thorium and uranium. I spoke of the “disassociation point” of the elements. “What comes after uranium?” I asked. And I answered back—“The result of the next step will be . . . the formation of . . . compounds the disassociation of which is not beyond the powers of our terrestrial sources of heat.” A dream less than twenty years ago, but a dream which daily draws nearer to entire and vivid fulfilment. I will presently show you that radium, the next after uranium, does actually and spontaneously disassociate.

The idea of units or atoms of electricity—an idea hitherto floating intangibly like the helium in the sun—can now be brought to earth and submitted to the test of experiment. Faraday, W. Weber, Laurentz, Gauss, Zollner, Hertz, Helmholtz, Johnstone, Stoney, Sir Oliver Lodge, have all contributed to develop the idea—originally due to Weber—which took concrete form when Stoney showed that Faraday's law of electrolysis involved the existence of a definite charge of electricity associated with the ions of matter. This definite charge he called an electron. It was not till some time after the name had been given that electrons were found to be capable of existing separately.

In 1891, in my inaugural address as President of the Institution of Electrical Engineers, I showed that the stream of cathode rays near the negative pole was always negatively electrified, the other contents of the tube being positively electrified, and I explained that "the division of the molecule into groups of electro-positive and electro-negative atoms is necessary for a consistent explanation of the genesis of the elements." In a vacuum tube the negative pole is the entrance and the positive pole the exit for electrons. Falling on a phosphorescent body, yttria, for instance—a collection of Hertz molecular resonators—the electrons excite vibrations of, say 550 billion times a second, producing ether waves of the approximate length of 5.75 ten millionths of a millimeter, and occasioning in the eye the sensation of citron-coloured light. If, however, the electrons dash against a heavy metal, they produce ether waves of a far higher frequency than light, and are not continuous vibrations, but, according to Sir George Stokes, simple shocks or solitary impulses; more like discordant shouts as compared with musical notes.

During that address an experiment was shown which went far to prove the disassociation of silver into electrons and positive atoms. A silver pole was used, and near it in front was a sheet of mica with a hole in its centre. The vacuum was very high, and when the poles were connected with the coil, the silver being negative, electrons shot from it in all directions, and passing through the hole in the mica screen, formed a bright phosphorescent patch on the opposite side of the bulb. The action of the coil was continued for some hours, to volatilize a certain portion of the silver. Silver was seen to be deposited on the mica screen only in the immediate neighbourhood of the pole; the far end of the bulb, which had been glowing for hours from the impact of electrons, being free from silver deposit. Here, then, are two simultaneous actions. Electrons, or radiant matter shot from the negative pole, caused the glass against which they struck to glow with phosphorescent light. Simultaneously, the heavy positive ions of silver, freed from the negative electrons, and under the influence of the electrical stress,

likewise flew off and were deposited in the metallic state near the pole. The ions of metal thus deposited in all cases showed positive electrification (Proc. Royal Society, Volume lxix, page 421).

In the years 1893-94-95 a sudden impulse was given to electric vacuum work by the publication in Germany of the remarkable results obtained by Lenard and Rontgen, who showed that the phenomena inside the vacuum tube were surpassed in interest by what took place outside. It is not too much to say that from this date what had been a scientific conjecture became a sober reality. . . .

In 1896 Becquerel, pursuing the masterly work on phosphorescence inaugurated by his illustrious father, showed that the salts of uranium constantly emit emanations which have the power of penetrating opaque substances and of affecting a photographic plate in total darkness, and of discharging an electrometer. In some respects these emanations, known as Becquerel rays, behave like rays of light, but they also resemble Rontgen rays. Their real character has only recently been ascertained, and even now there is much that is obscure and provisional in the explanation of their constitution and action. Following closely upon Becquerel's work came the brilliant researches of M. and Mme. Curie, on the radio-activity of bodies accompanying uranium. Hitherto I have been recounting isolated instances of scientific speculation with apparently little relation to one another. The existence of matter in an ultra-gaseous state ; material particles smaller than atoms ; the existence of electrical atoms or electrons ; the constitution of Rontgen rays and their passage through opaque bodies ; the emanations from uranium ; the disassociation of the elements—all these isolated hypotheses are now focussed and welded into one harmonious theory by the discovery of radium.

“ Often do the spirits
Of great events stride on before the events,
And in to-day already walks to-morrow.”

MARQUESS CURZON

(GEORGE NATHANIEL, BARON CURZON OF KEDLESTON,
K.G.).

(1859-1925).

HE was born at Kedleston, January 11th, 1859, as the eldest son of the Reverend Alfred Nathaniel Holden Curzon, Fourth Baron Scarsdale. Though trained at Eton and Oxford, he may have begun a still more important course in education later, when, in 1885, he began the study of Conservative Statesmanship as one of the Under-Secretaries of the late Marquess of Salisbury. From that position he ascended to the Viceroyalty of India (1898-1905) after a training in official life, gained as Under-Secretary of State for India (1891-92), Under-Secretary of State for Foreign Affairs (1895-98), and in Parliament as a member for Lancashire (1886-98).

His term as Viceroy was marked by a strenuous activity in all departmental reforms, the whole administration being overhauled from top to bottom. During this process, many problems came up for solution including those of the Indian Railway system, which is State owned. Difficult questions also arose out of the method of educating the teeming myriads of native children in Western knowledge. The enormous importance to Indian agriculture—and India is a great agricultural country—of a national system of irrigation for the crops was recognised and a system was completed in a masterly fashion.

The remodelling of the Police force is yet another reform which India owes to Lord Curzon while such questions as arose over marking the northern boundaries of the continent of India, found in him a jurist of unchallengeable knowledge, he being renowned for his travels in the Pamirs and in Asia generally. For his services as an explorer in these regions of the far East, he received the gold medal of the Royal Geographical Society in 1895. He was elected Chancellor of Oxford University in 1907, and Lord Rector of Glasgow in 1908, beating Mr. Lloyd George by twelve votes. He is himself an orator whose great natural gifts have been sedulously cultivated, oratory, of the modern Parliamentary variety, forming the subject of his theme as Rede Lecturer at Cambridge in November 1913; and his address re-issued in book form bids fair to become a classic on the art of public speaking.

Those who feel that ruling and elevating others is the responsibility of their birthright, may well feel under obligations to Lord Curzon as one of their most able representatives, as he well illustrates the idea that "noblesse oblige."

He delivered stirring orations on the War in 1914, and led the Opposition during the illness of Lord Lansdowne, November, 1914. He became Lord Privy Seal in Coalition Government formed May, 1915, published some interesting essays, translations, and poems, received the Order of the Garter on New Year's Day, 1916, and became a member of the War Committee in July, 1916, Foreign Minister in 1919, and a Marquess in 1921.

NATIONAL ORGANIZATION

(Speech delivered in the House of Lords, Dec. 19th, 1916).

I DO not think it necessary to say anything about the circumstances in which the change of Government has taken place. I am not one of those who regard the experiment of the Coalition Government as having been at all a failure; nor do I believe that that will be the reading of history in the future on the experiment in which several of us of both sides of the House have taken part during the last eighteen months. On the contrary, I believe that we were in many respects a very efficient Administration; and I have heard Mr. Asquith say more than once that in his long political experience he never had a seat in a more competent or efficient Cabinet than that over which he has just ceased to preside. The Coalition Government did enable men and parties who had hitherto been sharply divided, who had spent perhaps the greater part of their political life in opposing each other, to co-operate in the interests of the State. Both parties and men were united under a Prime Minister whom—and I know that I am speaking for my colleagues in the late Government on both sides—we regarded with profound respect, and whose services to the Government and to the country in the prosecution of this War appear to me to be in danger of receiving insufficient recognition. Nor do I think that the record of the Coalition Government is one of which they need feel ashamed. They raised armies in quality and in numbers undreamt of at any previous period of British history and unanticipated at the commencement of the War; they introduced, amid an assent which little more than a year ago would have been deemed impossible, compulsory military service in Great Britain; they retrieved the fortunes of the War in the first year of fighting and converted them into the notable and glorious victory of the Somme; they maintained

intact, and they greatly added to, the strength of the Navy, which still holds command of the seas ; and they paved the way, as we hope, for the victory which will ultimately be obtained.

Well, my Lords, in these circumstances it may be asked : Of what spirit or feeling is the change in the *personnel* of the Government the outcome ? I hope I shall not be wrong if I state my belief that the friendly welcome which has been accorded to the present Government, not least by your Lordships' House, has been due to the conviction that a greater and more concentrated effort, a more effective and universal organisation, a more adequate and rapid use of the resources, not of ourselves alone, but of the Allied Powers in conjunction with us, are required if we are to carry the War to the successful termination that we all desire. This country, my Lords, is not merely willing to be led, but it is almost calling to be driven. No one doubts what the people of the country want. They desire the vigorous prosecution of the War ; a sufficient, an ample return for all the sacrifices that they have made ; reparation by the enemy for his countless and inconceivable crimes ; security that these crimes shall not be repeated, and that these sacrifices shall not have been made in vain. They desire that the peace of Europe shall be re-established on the basis of the free and independent existence of nations, great and small ; they desire, as regards ourselves, that our own country shall be free from the menace which the triumph of German arms, and still more the triumph of the German spirit, would entail. It is to carry out these intentions that the present Government has assumed office, and by its success or failure in doing so will it be judged.

Your Lordships may, perhaps, expect me to say something about the constitution, if not the composition, of the present Administration. It will not be denied that the reconstruction of the Government has been attempted on novel lines, and I expect the writers of constitutional history text-books in the future will have a good deal to say about the proceedings that occurred in December, 1916. The only times during the last 150 years of our history in which there have been Cabinets of numbers as low as ten were in the great War Administration of Mr. Pitt from 1783 to 1801, and the short-lived Administration of Mr. Perceval in 1810. Only four times in the same period has the number of the Cabinet been as low as twelve, the last occasion being the famous Administration of Mr. Disraeli in 1874. The whole of the rest of the Ministries of the past century and a half have varied in numbers—I speak of the Cabinet—from thirteen upwards, culminating in the figure, not always spoken of with reverence, of twenty-three of the Coalition Government to which some of us recently belonged. Now we have a Cabinet of five, or, as it finds itself not infrequently in session, of four.

Public opinion will, I think, have recognised the principles upon which the Prime Minister has formed his Administration. They are three in number. The first is the concentration of executive authority in the hands of a small number of persons, the majority of them not holding portfolios, the object, of course, being to secure promptitude in decision and vigilance in action. The second principle has been the prominent part assigned to labour. My Lords, without labour this War cannot be won. Without the organisation of labour it cannot be effectively pursued. Labour is entitled, therefore, to a powerful voice in its direction. The third principle has been the employment of expert ability in high official positions and in important Departments, whether or not it has been previously connected with Parliamentary associations. This also is to some extent a novel departure.

My Lords, as regards the mechanism of Government, that is rapidly taking shape, and in less than a week things are in fairly good working order. Perhaps your Lordships may allow me to give you a brief explanation of the main features of the Government as it exists in the minds of those who have framed it. The supreme executive authority for the conduct of the War is, as I have explained, vested in the small Committee or body of men whose names are familiar to your Lordships. That Committee sits every day, and sometimes two or three times in the day. It is in truth, as it is called, a War Cabinet. There is no other Cabinet constituted as a body and meeting regularly under the presidency of the Prime Minister with collective responsibility for all the acts of Government. This does not, of course, mean for one moment that the members of the War Cabinet are divorced from close association with their colleagues, or that the Departments of Government not directly represented in the War Cabinet will be run on independent lines. An effective *liaison* between the two must obviously be maintained by means of conferences and meetings intended to bring about a common action and a common aim. Similarly as to the conduct of the War, no one would imagine for one moment that the War Cabinet can act independently or without constant and almost hourly consultation with its technical advisers.

In all matters affecting the conduct of the War by land and by sea the Chief of the Imperial General Staff, Sir William Robertson, and the First Sea Lord, Admiral Jellicoe, are invariably in attendance. It is also obvious that there must be many occasions when the policy of the two great fighting Departments, the War Office and the Admiralty, must come under discussion, and when it can only properly be so discussed and determined in the presence of the Secretary of State for War and the First Lord of the Admiralty. Similarly, it is difficult to imagine an

occasion when there are being discussed in the War Cabinet our relations with Foreign Powers, or our dealings with our Allies on the Continent, at which the Secretary of State for Foreign Affairs and the Permanent Under-Secretary of that Department should not be present. On other occasions it will be the Secretary of State for India the Secretary of State for the Colonies, the President of the Board of Trade, or the head of some other important Department who will attend. The plan adopted is really closely analogous to the plan of a body with which the noble Marquess opposite (the Marquess of Crewe) is, I am sure, very familiar—namely, the Committee of Imperial Defence. That body was set up now fifteen or twenty years ago by Mr. Balfour, and the plan upon which it has always proceeded has been a small nucleus continually replenished by Ministers coming in from other Departments when their advice was needed or their attendance required. But the essence of the arrangement as applied to the Cabinet is that these high officials of whom I speak will come when they are required, and will go when their work is completed. The one body that is in permanent session and is finally responsible is the War Cabinet, under the presidency of the Prime Minister.

I said just now that this was a novel arrangement. So it is. I do not say that in practice it will always be an easy arrangement to work. It is like the Government itself, somewhat in the nature of an experiment ; but I think we may count upon the public spirit and patriotism and individual self-abnegation which have characterised the inception of this venture to give it a fair chance of continuing with success. At any rate, my Lords, this tribute has been paid to the soundness of the principles upon which the Government has proceeded, that no sooner was it announced that this change had taken place in this country than the Governments of our Allies seem to have recognised the immediate necessity for a corresponding substitution of a very small executive body for the larger and old-fashioned Cabinets which had previously existed in their countries just as in ours. I do not say that they have done it in the same way or precisely on the same lines, but France and Italy, as your Lordships may have seen from the newspapers, have greatly contracted the size of their Cabinets, and I shall not be surprised if we find that a similar change takes place before very long in Russia.

Now, my Lords, I come to the problem with which the Government have to deal, and it may be stated, I think, in a very few words. We have to keep up our armies in the field and to give to our commanders in all the theatres of War—in France, Flanders, Salonika, Egypt, Mesopotamia—the men whom they require to maintain their forces at full strength and to provide for the greater work that lies before them in the future. Secondly, we have to keep or to obtain the men, and I think

I may add also the women, who will give us increased supplies of food, munitions, and shipping, and who will maintain the essential industries of the nation. Thirdly, we have to organise our resources in manhood, material and money, so as to devote them along with our Allies, with whom I think there must be even closer co-operation and co-ordination in the future than there has been in the past, to the successful prosecution of the War.

How can these objects be attained? I do not conceal from your Lordships that far greater sacrifices will be called for from our people than any to which they have hitherto submitted; that far greater restraints upon individual conduct and personal liberty will be entailed than those to which the assent of Parliament has yet been given. We shall have within the next few months to revise many of our ideas and much of our practice. I wonder if the country has at all fully realised the extent to which the British people, the most liberty-loving, the most individualistic, and in some respects the most independent in the world, have already during the past two years parted with their traditional rights and privileges, as they would previously have described them, and handed them over to the State? Early in the War we took over the principal railways of Great Britain. We have now done the same, for reasons into which I need not enter, with the railways of Ireland. The merchant shipping of the country has now for more than a year been practically entirely under Government control. The compulsory acquisition of property has become a matter of almost daily occurrence. We are all familiar with the general and stringent control of the Press. Under the Munitions Act we were introduced to compulsory limitation of profits, compulsory arbitration, compulsory prohibition of strikes and lockouts, and compulsory fixing of wages. I remember being responsible for introducing and explaining that Bill in your Lordships' House, and I confess that, making the best case for it I could, I little anticipated at the time how small the dislocation would be that the national life would have to experience, and how smoothly and with what general consent the powers would be wielded. Recently, my Lords, we have begun to control the raw materials of industry and articles of common consumption. Sugar and imported wheat are under Government control; the same is true of steel, wool, and leather. We began to ration with petrol, and I shall be very much surprised if my noble friend Lord Devonport does not before long take us a good deal further. Last night those of us who dined at clubs found no difficulty in accommodating ourselves to the modest exigencies of a three-course repast, and I have no doubt that we shall all be the better in a short time for the one meatless day in the week which I see is promised. Prices have already been arbitrarily

fixed for many articles of food. Finally we took, early in the present year, the step to which I alluded a little while ago and which has worked on the whole with so much smoothness—the step of applying the principle of compulsory military service to men of military age in this country. This is only a brief, and I daresay quite an incomplete, summary of the measures of restraint to which the country has cheerfully submitted, but it gives some idea of the progress that has already been made. It began with the Liberal Government who were in power when the War commenced, it went on with the Coalition Government, and it will, I expect, find new developments and proceed with greatly accelerated speed under the Administration which is now in office.

Now, my Lords, I ask the question : Does anyone complain of this great change in the procedure and practice of our everyday life which has been brought about by the circumstances of the War? I think not. I remember some twenty or thirty years ago the late Sir William Harcourt uttering the remark : “ We are all Socialists now.” What that eminent man would have said had he lived to the present moment I can scarcely conceive. I think he would have gasped at some of the encroachments on personal liberty to which we are now contentedly submitting. But the fact is that there is no surrender of traditional convention, no sacrifice of personal comfort or convenience to which the people of this country are not ready to submit provided they can be assured that they will not be in vain.

Your Lordships will now expect me, after these general hints and indications, to pass on to some of the developments of this policy to which the new Government propose to ask the consent of Parliament and the nation. The first is in regard to shipping. There has been appointed an experienced and eminent shipowner to the post of Controller of Shipping. He sits as president of a Committee of whose operations I can speak with first hand authority, because I have had the honour of occupying its chair for nearly a year myself, and I know, therefore, some of its labours. That Committee consists of one member of your Lordships' House, Lord Faringdon, and three other shipowners of acknowledged influence and position in the trade. We have during the past year wielded silently but without objection very large, and in some respects almost dictatorial, powers. These powers are now being regularised and placed in the hands of a chairman better qualified to perform the duties than I was. He is in consultation with his colleagues, and it would be premature to discuss the actual form which their joint recommendations will take. The two great problems, are, of course, the utilisation of all available shipping to the best advantage, and shipbuilding,

ship manufacture, so far as labour and material can be obtained, to make up the wastage. It is in contemplation by the Government to nationalise the shipping of the United Kingdom, and if this be successfully carried out, one result, I hope, among many that I need not mention, will be the reduction of the extravagant freights that have in so many cases undoubtedly contributed to high prices in this country.

The second illustration that I would give is that of mines. One of the latest acts of the last Administration was to take over the South Wales coalfields. I am not quite sure, but I think I am right in saying that when the late Government decided upon that step they had in view the extension of the proceeding over a much wider area. Anyhow, that intention is to be carried out by His Majesty's present advisers, and they propose to take over the whole of the coal mines of the country. The third illustration that I would give is that of food. The real danger, of course, in this matter is the failure of our crops, and drastic action is required to meet this deficiency. That action must be twofold in character—firstly, as affecting distribution; secondly, as affecting production. Both are likely to involve compulsory methods of a somewhat severe character. As regards distribution, it is essential that the excess consumption of the affluent should not be allowed to create a shortage for the less well-to-do. That will be the basis of the methods of distribution. As regards production, it means the utilisation of every available acre of land and all available labour for the production of food. One of the difficulties, of course, is the dearth of skilled men drawn away, sometimes taken away by the action of Government, for other spheres of work in connection with the War; but by a proper distribution it would seem that one skilled man working with unskilled labour under him may be able, in the case of farms, for instance, to do the work, not of one farm alone, but, by a system of co-operation, of several. In the organisation of food productions your Lordships may, I am confident, if you are willing, as you will be, play a very prominent part. There is a good deal of ornamental land in this country that might be used for the production of food. Still more, there is a good deal of ornamental labour in the country that might be converted to more practical uses. I speak of the men who are concerned with what I may call the familiar amenities of country life—men who are keeping up gardens and looking after hothouses and lawns, and so on, or very likely engaged in some cases in the preservation of game. I am very well aware of the great sacrifices that have already been made by many in the position of your Lordships, and of the surrender that you have voluntarily given of so many of these amenities to which I refer; but in the months that lie before us, when every man will be required,

there are some cases in which, I think, the operation can be carried further, and I feel certain of the co-operation of your Lordships with His Majesty's Government in their attempts in that direction.

But, my Lords, we must proceed much further than this. I spoke just now about organising the entire population of the country. Now, what is being done at this moment in Germany? At the very moment when she is talking of peace she is making the most stupendous efforts to prosecute the War. To find men for her Armies she is squeezing positively the last drop out of the manhood of her nation. She is compelling every man, woman, and child between the ages of sixteen and sixty to enter the service of the State. At the same time, with a callous ferocity and a brutal disregard to all international obligations and practice, she is driving the population of the territories which she has occupied into a compulsory serfdom in her own country. She is even trying to get an army out of Poland by offering it the illusory boon of a semi-independent kingdom. That is the nature of the challenge that we have to meet. How is it to be done?

The problem can, I think, be stated in simple terms. Nearly a year ago we decided that, in order to maintain our Armies in the field, the nation must have complete control over all its military resources in men; but it is impossible to take a man into the Army without taking him from some civil employment of greater or less utility, and it has been our object—an object which we are more and more perfectly attaining as time goes on—to establish such a system of recruiting as will ensure that no man is taken into the Army who is capable of rendering more useful service in industry. To complete our plan, to make our organisation of the national resources perfect, we ought to have power to see that every man who is not taken into the Army is really employed on work of national importance. At present it is only the man who is fit for military service and who has not established a claim for exemption on whom the nation has a call. The unfit man and the exempted man are surely under the same moral obligation. But the State has no means of enforcing this obligation. It is with this imperfect organisation of our industrial man-power that we are called upon to confront an enemy who is not only exercising to the full his right to levy his whole population, but in the manner that I have just described has introduced a practice, unknown hitherto to civilised warfare, of removing the civilian inhabitants of occupied territory in order to make good the shortage of labour in his own factories. We need—and I think your Lordships' cheers just now encourage me in the remark—we need to make a swift and effective answer to Germany's latest move; and it

is surely not too much to ask of the people of this country that they should take upon themselves for a few months and as free men obligations which Germany is imposing upon herself.

As our Armies grow our need for munitions grows. But a large part of our labour for munition purposes is at present immobile. There may be a surplus in one factory and a shortage in another, but we have no power to transfer a man from one side of the street to the other. As the months go by the cost of the War increases; our purchases in neutral countries become more difficult to finance. Yet there are thousands of men occupied in industries which consume our wealth at home and do nothing for our credits abroad. But we have no power to transfer them from places where they are wasting our strength to places where they could increase it. These are the powers that we must take, and this is the organisation that we must complete. The matter is not new. It was considered in the last week or two of the life of the late Government by the War Committee of that Government upon the simultaneous but independent recommendation of the then Ministry of Munitions, the Man-Power Board, and the military members of the Army Council; and it was unanimously decided by them that the time had come for the adoption of the principle of universal national service. It was one of the first matters taken up by the present Government, and the present War Cabinet have unanimously adopted the conclusion come to by the preceding War Council. We believe that the plans we have in view will secure to every workman all that he has a right to ask should be assured to him.

I now come to the plan, about which your Lordships will not expect me to give more on the present occasion than a general outline. In order to carry out this object it is proposed to appoint a Director of National Service, to be in charge both of the military and civil sides of universal national service. The civil and military sides of the Directorate will be entirely separate, and there will be military and civil directors responsible to the Director of National Service. The military director will be responsible for recruiting for the Army and will hand over to the War Office the recruits obtained. I need not elaborate that aspect of the case, because no substantial alteration is suggested in the methods of recruiting for military service. As regards civil service, it will be proposed that the Director of National Service shall proceed with the scheduling of industries and of service according to their essential character during the War. Certain industries will be regarded as indispensable, and the Departments concerned will indent upon the Director of National Service for the labour which they require for those services. The other services will be rationed in such matters as labour, raw material, and

power. The labour thus set free from non-essential and rationed industries will be available to release potential soldiers who are at present protected from military service, and to increase the available supplies of labour. This labour will be invited to enrol as workers and to be registered as war workers on lines analogous to the existing munitions volunteers, with similar provisions as to rates of pay and separation allowances. The Government have no doubt that when it is realised how essential to the life of the nation it is that the services of every man should be put to the best use, we shall secure an adequate supply of volunteers. We are taking immediate steps to secure by these means the men we want. We shall begin as soon as may be to classify industries and to invite the enrolment of volunteers. But if it be found impossible to get the numbers we require, we shall not hesitate to come to Parliament to ask for relief from pledges given in other circumstances and to obtain the necessary powers for rendering our plans effective. The nation is fighting for its life and is entitled to the best service of its sons and daughters.

Let me add another but not unimportant point. While the nation is making such enormous sacrifices as those to which I have referred, it is not tolerable that any section of the community should be permitted to make exceptional profits out of the sacrifices of others, and by that means actually to increase the burden which is borne by others. A good deal has already been done, as your Lordships know, to arrest unfair profiteering, as it is called, arising out of the War. But the Government have come to the conclusion that even more drastic steps will have to be taken. There are several ways of dealing with this problem. One is to annex all War profits; the other is the cutting down of prices so as to make excessive profits impossible. The Munitions Act adopted both these expedients—90 per cent. of the profits, as your Lordships know, in the controlled firms were annexed. In addition to that, there has been a most searching revision of prices in the controlled firms and enormous reductions have been achieved. The problem is now being carefully examined by my right hon. friend the Chancellor of the Exchequer and others, and we hope to be able to make an announcement shortly as to the course which the Government intend to adopt. It is evident that when the nation is being asked to make further sacrifices in order to win the War the road should be cleared by action of this kind.

I have so far dealt—not, I hope, at undue length, certainly as concisely as I could—with the domestic programme of the Government. Your Lordships may expect me, before I conclude, to say something about the military and political situation abroad. I am not one of those

who believe in painting too rosy a picture of affairs. The facts and the inferences to be drawn from those facts are known to everybody. That does not mean that we ought now, or at any time, to take a gloomy view of matters, but it does mean that we ought to take a stern view of the realities of the case. You will never get the best out of the people of this country—and that is the task upon which we are engaged—by feeding them with sweetmeats or by putting blinkers across their eyes. There is no use in concealing the fact that the enemy, by his military successes, has obtained a position of vantage in some of the main and in many of the minor theatres of War. He still remains in occupation of almost the whole of Belgium and of a large portion of Northern France. He has swept the Serbians and the Montenegrins out of their country ; he has appropriated Russian Poland ; he has broken down the resistance and captured the capital of Rumania. But your Lordships must not think that he has gained all the successes even in Rumania that the words of the Imperial Chancellor, quoted in the newspapers during the last few weeks, would appear to suggest. Great felicitations have been heard as to the capture of supplies of oil and wheat, and so on, in Rumania, but it may be of interest and of consolation to your Lordships to know that, by action which His Majesty's Government were mainly instrumental in bringing about, the whole of the oil-wells, refineries, and stocks in that part of Rumania which is now in the occupation of the Germans were destroyed before the invasion took place. Again, although a considerable part of Rumania is overrun by the enemy, the larger portion of the Rumanian Army is still intact, and will be reformed for resumption of warfare in the early spring.

The most vain and futile thing would be if I were to attempt here—indeed, it would be an invidious task—to discuss the causes of Rumania's failure. It is one of the tragic incidents of the War ; and really if you look at it the failure has been inherent in, or at any rate is explained by, the geographical position of that country. The only military Power which could come to the assistance of Rumania was Russia, and with energy and self-sacrifice and devotion Russia, hard pressed herself, has done what she could in those respects. But if you look at our position you will realise at once that we could not put armies into Rumania. The utmost we could do was to dispatch guns and rifles and munitions to Rumania ; and, bear in mind, that they had to pursue a circuitous route thousands of miles in length, crossing the Northern Ocean to Archangel and then finding their way down by long railway tracks to Rumania in the South. The utmost we could do was to send these supplies to Rumania, to help them with loans and advances of money, as we did, and to engage the common enemy by an active offensive

from our military base at Salonika. That assistance we endeavoured to the best of our ability to render. It may be said that this is a depressing picture. Yet the spectacle of the successive victories of the Central Powers over the petty States who surround them like a fringe, dramatic and overwhelming as it may appear at first sight to be, represents only a corner of the canvas. The late Lord Salisbury once told us all to acquire proportion by looking at large maps. May I suggest to your Lordships that in this War we ought to endeavour to take the larger view? You do not win a game at chess by sweeping the small pawns off the board; their fate does not determine the ultimate issue of the game.

I ask your Lordships for a moment to reflect what changes in the external aspect of the War this last year has produced. Just as the first year of the War saw the failure of the main German offensive against Calais and Paris, so the second year has witnessed the practical abandonment of the offensive against Russia, at one time thought to be not only imminent but dangerous, the collapse of the Austrian offensive against Italy, the colossal and re-duplicated failure of Verdun—a failure on Germany's part which constitutes the most extraordinary tribute to the heroic vitality of our Allies and will always remain an imperishable incident in the history of the Army of France. But even more reassuring omens, may, I think, be drawn from what I described almost in my opening sentences as the great and notable victories on the Somme. Now, why did I use that language? The success of our operations there—by “our” I mean the French combined with our own—is not to be measured by the positions taken, or by the number of miles of ground recovered; it is to be measured by the moral and material effect produced upon the two fighting forces. I distrust statistics, at any rate of casualties in war, and I say nothing about the casualties which the German Armies are alleged to have suffered, although about one thing I think there is very little doubt, and that is that they have been greatly and almost overwhelmingly superior to our own. Neither do I attach too much importance, although it is not insignificant, to the fact that since July 1st to the present date the combined armies of France and England—on the Front to which I am alluding—have taken 105,000 German prisoners, 150 heavy guns, 200 field guns, and 1,500 machine-guns belonging to the enemy. There have been much more important consequences than these. In these encounters, as your Lordships will hear from any General Officer or private serving at the Front, the Germans have been defeated, and the Allies have been a victorious Army. Large forces of the German Army have been defeated, not once, but twice and thrice. The Allies have established an incontestable superiority not merely in the fighting strength and stamina of their men, but in

artillery and in the air ; and the achievements of our airmen at the front during the last five or six months constitute in reality one of the most glorious and creditable episodes of the entire War. Above all, there is irrefutable evidence, from the wholesale and voluntary surrender of Germans, from the statements made by prisoners, from the evidence of orders and papers found in the German trenches, that their moral is greatly shaken, that their forces are sick of fighting, and that many of them are hopeless of ultimate success. And when we add to this the evidence, accumulating every day, of the interior condition of Germany, the increasing strain on her resources, the depletion of her supplies, the food riots and strikes, so successfully kept out of the newspapers, the admitted hunger, amounting in some places almost to starvation, the progressive physical deterioration of her people, there is good ground for believing that the outlook is not quite so good for the Central Powers as they would have us believe, and that our attitude need not be one of despondency or alarm.

It is at this moment ~~that~~ Germany has come forward with offers of peace, or, rather, I cannot fairly use the word "offer," but rather let me say vague adumbrations and indications of peace. I ask your Lordships to observe what has been the course of events. First, there was the speech of the Imperial Chancellor in the Reichstag, which has been published in the newspapers, and upon which I shall have to comment in a few moments. Next, there was the Note to the Powers. The text of that Note has also been published in the Press, although in its official form it only reached His Majesty's Government through the American Ambassador yesterday morning. Now, what does this Note contain? I ask your Lordships' close attention to the words. First, it proclaims the "indestructible strength" of the Central Powers; it claims that Germany is not only undefeated, but undefeatable. Secondly, once again it advances the plea that Germany was constrained to take up arms for the defence of her existence and the freedom of national development. Thirdly, it avows German respect for the rights of other nations. Fourthly, it says that the Central Powers do not seek to crush or annihilate their adversaries. Fifthly, it expresses their desire to stem the flow of blood and to bring the horrors of War to an end. And finally, after this somewhat remarkable preamble, they declare that they propose even now—observe the implication of the words—"even now," in the hour of their "admitted triumph," they propose as an act of condescension to enter into peace negotiations. As to what form these negotiations should take, as to the terms that may be in the minds of Germany or her Allies, not a word has been said.

I do not comment—it would really be too cheap to do so—upon the terms of the Note which I have quoted. I say nothing about their curious history and their even more curious morality. Both may be left to explain themselves, and every man can form his own judgment of their value. Neither will I pause to discuss the motives by which this action on the part of the Central Powers may have been actuated. But, my Lords, as regards peace, is there a single one of the Allied Powers who would not welcome peace if it is to be a genuine peace, a lasting peace, a peace that could be secured on honourable terms, a peace that would give guarantees for the future? Is there a single Government, or statesman, or individual who does not wish to put an end to this reign of Satan which is turning half the world into a hell and wrecking the brightest prospects of mankind? But in what spirit is this proposal put forward, and from whom does it come?

Here I must turn, as I said I would turn just now, to the speech of the Imperial Chancellor by which it was introduced to the world. Let me read a few passages from that speech. He begins by a tribute to Field-Marshal Hindenburg:

“This unparalleled genius has made possible things which were hitherto considered impossible. And Hindenburg does not rest; military operations progress.”

Secondly, as regards supplies, he says of Germany:

“We could have lived on our own resources, but now (after what has passed in Rumania) our safety is beyond question.”

Thirdly:

“To these great events on land heroic deeds of equal importance were added by our submarines.”

My Lords, the deeds are unquestioned; heroism is not, perhaps, precisely the epithet we would all of us seek to apply.

Fourthly:

“The spectre of famine which our enemies intended to appear before us now pursues them without mercy.”

Fifthly, there is the familiar invocation of a Higher Power:

“Our strength has not made our ears deaf to our responsibility before God, before our own nation, and before humanity.”

And lastly; we have the statement that during these long and earnest years of War the Emperor has been moved by a single thought—how peace could be restored so as to safeguard Germany—not to safeguard anybody else—so as to safeguard Germany after the struggle in which she has fought victoriously.

I ask only : Is this the spirit in which your Lordships think that peace proposals should be made ? Does it hold out a reasonable prospect of inducing us to lay down our arms ? Is there any indication in the remarks of the Chancellor of the desire of those with whom he is allied to make reparation, to propose restitution, to give guarantees for the future ? No, my Lords. So far as we can judge from that speech—and it is all we have to judge by at present—the spirit which prevails in every word and line of it is the spirit of German militarism, unrepentant, arrogant, still indulging in the same travesty of facts, in the same blasphemous appeals to a Higher Power, in the same protestation of injured innocence, in the same menace and threats against the foe. While that speech was being made the Belgian deportations were going on, and an even more active resumption of submarine atrocities is being prepared. We know that the peace of God passeth all understanding. I am not sure that the same may not be said—in a different sense—of the peace which commends itself to the minds of the authors of that speech and that Note. ♦

The first answer to this movement has already been given by the Ministers of France and Russia, and has been read by your Lordships in the newspapers. Their speeches have appeared at length. An answer is being given in another place at this moment by the Prime Minister of this country. I doubt not, my Lords, that it will be the desire and the intention of the Allied Powers to return a reasoned reply to the Note which has been presented to them. They will doubtless deal with the allegations which are contained in the Note and to which I have referred, and they will want to know where we stand. It is said that the Germans have formulated certain terms upon which they are prepared to negotiate, and which before long we may see. We know nothing of that. We have had no indication of it whatsoever. We only have the ominous tone of the Note itself and of the speech that accompanied it.

Let me put one more reflection before your Lordships. Let no one think for a moment that it is merely by territorial restitution or by a reversion to the *status quo ante* that the objects for which the Allies are fighting will be attained. We are fighting, it is true, to recover for Belgium, France, Russia, Serbia, and Rumania the territories which they have lost, and to secure for them reparation for their cruel wrongs. But you may restore to them all, and more than all, the losses they have experienced ; you may pile indemnities upon them such as no Treasury in Europe could produce, and yet the War would have been in vain if we had no guarantees and no securities against a repetition of these things in the future. That is what we are fighting for. We are not fighting,

as I sometimes see represented in German papers, to crush or to destroy Germany. Such an idea I do not believe has ever entered into the mind of a thinking human being in this country. But we are fighting to secure that the German spirit shall not crush the free progress of nations, and that the armed strength of Germany, augmented and fortified, shall not terrorise the future of mankind. We are fighting that our grandchildren and our great-grandchildren after us shall not have, in days when we have passed away, to go again through the experience of the years 1914 to 1917. This generation has suffered in order that the next may live, and that the next but one may be free. We are ready enough for peace when these guarantees have been secured and these objects have been attained. Until then we owe it to the hundreds of thousands of our fellow-countrymen and our Allies who have shed their blood, many of whom may at this very hour be giving up their lives for us, to be true to the trust of their splendid and uncomplaining sacrifice and to endure to the end.

ALFRED DEAKIN

(1856-1919).

ALFRED DEAKIN was born at Melbourne on the 3rd of August, 1856, and received his education at the Grammar School and University of his native city. Adopting the law as a profession, he became a barrister. He was always a keen politician and became member for West Bourke in 1879. His great natural gifts as a debater soon brought him into prominence and he was made Minister of Public Works in 1883, a post which he held for the next three years. He also became Solicitor-General in 1885, and in the year of the first Victorian Jubilee (1887) he was a delegate to the Imperial Conference held in London.

As a strong Federalist, he was selected to represent Victoria, in the delegation from Australia to London that was intrusted with passing the Bill embodying the Commonwealth of Australia.

Mr. Deakin was now generally recognised as the leader amongst those contemporary colonial statesmen who strove for federation and the essential unity of our Empire. He had always been famous for his powers in setting forth an argument in lucid yet vigorous English, and both these qualities were brought into increased prominence upon his elevation as Prime Minister of the Commonwealth of Australia (1909-10).

England found an opportunity to do honour to this great Imperialist when he visited London for the Imperial Conference in 1907. During this visit, Mr. Deakin was made a bencher of Gray's Inn; and received the freedom of the cities of London, Edinburgh, and Manchester. Apart from politics and law, he was an expert on Irrigation, and published many books on the subject: "Irrigation in Western America," (1885)—"Irrigation in Egypt and Italy," (1887)—"Irrigated India," (1892)—and "Irrigation in Australia," (1893). He was also the author of a book of travel-sketches "Temple and Palm," (1894). He was one of the most prominent figures at the Imperial Conference, 1907, and was an enthusiastic believer in Colonial Preference.

A life-long book-lover, he once declared that reading formed his chief solace and recreation in life.

NEEDS OF EMPIRE

(Address delivered by HON. ALFRED DEAKIN, May 15th, 1907, at the Imperial Conference, London).

IN the Conference and out of it, I have been proud to reckon Dr. Jameson one of my best friends ; how is that delusion destroyed ?

He has made a raid, he has commandeered every argument upon the subject upon which we are both supposed to address you. I appear before you as the apologist for my share of the speech, but with the gratification that in his capable hands it needs no further recommendation.

My position in this country, like his, has been from the first one of considerable embarrassment. There were two conflicting obligations. The first was to represent the Commonwealth of Australia, and to speak its wishes without flinching. The next obligation was to steer as wide as possible from all your party strifes. With them our people have no immediate relation. We must touch the same questions at certain points, but they will not be dealt with in a party fashion if we can prevent it. Consequently, when I attempt to touch the subject which has been so practically handled by Dr. Jameson, I find myself placed under special embarrassment, since on this, the chief practical question before the recent Conference, it is not possible to touch in any way, without in some degree, and incidentally, at all events, dealing with the position in this country. There can be no reciprocity which is one-sided. There can be no preference, mutual preferences, discussed that does not imply at least a consideration of the attitude of both countries. Consequently, on this question all that is possible for me in fulfilling my mandate from my own country is to endeavour to consider it from our side only, and not from your side, except as far as that must be necessarily implied. We have undertaken to build, in part we have built, and we are quite prepared to finish, our half of the bridge of union. We are carrying it on to the centre arch. There we must wait for the building from your side. Not till you approach us, not till you join us in its centre arch, can we insert the key-stone that completes the work. But I confess that it is a little difficult to restrain oneself in economic argument here when one hears so familiarly what we consider frank fallacies in fiscal argument. We are obliged to listen to the doctrine without more than a mental protest, that you can have no duties imposed, that are not burdens of taxation upon the consumer,

though our own experience discriminates between duties most distinctly, as experience always will. We have to listen to the assertion, that no preference is possible, except by taxing your raw materials—a proposition which, so far as we know, has never been submitted from our side of the water. We have to listen to the fallacy that the preference we offer you, is no preference, although we have the refutation within our own knowledge. Only in the last sessions of the Commonwealth Parliament, being subject to invasion of an industrial character by potent organisations from a foreign country aiming at the destruction of an industry associated with the manufacture of machinery, we raised our tariff excessively. What was the immediate consequence? That before I left Australia for this voyage, I was informed by the competitor, leaving his own land, he was coming from over-sea to establish his factories in our country, to employ our own labour, instead of that of the foreigner. Then he was welcome, because he stood upon the same ground, where our own industrial manufacturers now stand. I have heard more. I have heard to-day of an instance, which appears to be absolutely established, not of what preference can do, but of what even the promise of preference can do in your own country.

I have heard of an industry, the chief product of which was electrical machinery, which was waning in the neighbourhood of London, which has recently passed into other hands, a controlling interest having been acquired by American Capitalists who are now re-organising and reconstructing those works. With a view to what? To entering upon the English market? No; they have that already. They can produce more profitably and import more profitably from New York than they hope to do here. They came here then for what purpose? Because, as far seeing men, they see that preference is coming. Their best markets to-day, are to be found in the British Colonies. They sell us several millions worth of their goods each year.

The ten per cent. preferential tariff, that we hope to see established would make all the difference. They leave New York, coming to Britain to employ British workmen, and establish a British manufacture, in order to win their entrance into the Australian and Colonial markets. If the mere promise of preference would do that, what would the actuality accomplish? It would give you the opportunity of retaining that hold over our markets, the recent losses in which, by the admission of the President of the Board of Trade himself, constitute a most serious feature in the returns which he had to lay before the conference.

Gentlemen, we do not ask you, as my friend Dr. Jameson said, to accept our dicta, or adopt our theory. We ask you simply to judge upon the facts before you and from your own experience, and to have

the open mind which only can judge. Do not affect to meet our arguments merely, as Dr. Jameson said, by the citation of what some are pleased to term "immutable laws"—imaginary laws would be a better title for some of them—why "immutable laws," when they are immutably believed in only in this country—"immutable laws"—which every other foreign country without exception steadily ignores; "immutable laws," which every one of your Colonies—men of your own blood, trained in your own school, reared in your own economic doctrines—ignore also.

Where is the twelfth obstinate jurymen? Not in the foreign countries, and not in your unanimous Colonies. You must look for him in your midst. You are told that however good a business prospect looks, it cannot be really good because it is in conflict with "immutable law." You are told that when it proves good, it must still be bad because "immutable law" will by and by show that you have lost something else. Yet we can challenge reference, not only to the reasoned judgment, but to the deliberate action of capable statesmen, amongst the most capable the world has ever seen, peoples of capable business men, who are fighting you in your own markets, and teaching you their capacity. All the people in every country in the world to-day are adopting means for the protection and development of their own trade.

No, Mr. Chairman, we do not appear before you as doctrinaires. We do not adopt Protection as what Dr. Jameson calls a shibboleth or a fetish. In the Commonwealth of Australia to-day we are still one-third Free Traders, because one-third of all the goods we import enter duty free. We use Free Trade where it pays—and we use Protection where it pays. The object is not to look for "immutable law," but to see what is profitable. And, gentlemen of the Baltic, may I remind you, when you first came under the spell of this immutable doctrine, one of your greatest expectations lay in the development of an export of that particular belief. Your economic doctrine, then brand new, was to awaken such enthusiasm among other nations, that they were all to rush to its adoption. They did not adopt it. And why? Perhaps, because they were nations—perhaps because they intended to remain nations. Perhaps because they held that no abstract thesis should require them to sacrifice the control of their own markets, for the benefit of their own people.

You continued to export it, and are continuing to press it on them even to this day. Of all the industries that you have ever carried on, this has had the amplest opportunity. You have been exporting it all the time—no Custom House has prevented it. For sixty years it has been on the free list of every country in the world, every country

that has imported it, has very promptly exported it. None of them kept it for home consumption. They were quite satisfied to leave you a monopoly, and a monopoly it remains. This kind of wisdom, so far as we can judge, will die with us. It will be "interred with our bones" and may hurry the interment. I doubt if it will ever smell sweet or blossom in the dust. But, Mr. Chairman, we on the contrary venture to maintain that commerce needs cultivation, that commerce needs care; for instance the fostering care that can be extended to it by great associations like your own. They spring up. For what reason? Because your individual members, belonging to the same nation, living in the same city, engaged in the same trade, and thus keen rivals one with another, find forced upon you by the circumstances of your business the necessities and advantages of the co-operation against other traders. This great Exchange exists to-day, because you are business men, with a keen eye to business possibilities. If this magnificent building did not serve these uses, its floor would be untrodden, and these majestic pillars would look down on an empty hall.

What brings you into business combination, brings countries into business combination all over the world; and when that combination is backed by and based upon citizenship, with its needs for mutual protection and mutual support, is there anything to which that combination can be better applied than in developing the resources of your own people and your own nation? We have heard that the strength of this Empire lies in its ships, colonies, commerce. Without commerce what employment for your ships, and without your commerce what would be your relations with your Colonies? If each of all our sister Imperial States depends on commerce, and is made by its means, can we be said to be outside our province of joint action and inside the prohibition of some immutable law of passive submission? Are we alone forbidden to use the same co-operative power which you employ so well in your various businesses, in this great emporium of the world?

Of course, I may be asked, "What do we want as long as British commerce thrives as never before? Look at our totals."

If time permitted and the materials were at hand, I should like to analyse them in order to discover what profit they yielded to strictly British industry and British investment. In the meantime, I am content to say—"Look at everybody else's totals."

Look at the totals in Australia. You point to your returns of last year as the highest you ever achieved. We point to ours; yet Australia denies your "immutable law."

Look at the various countries of Europe and the United States, your competitors. You will find everywhere a record breaking year. If to-day's prosperity belonged to you and to you alone, you might draw the inference, which is being continually suggested to us ; but until you can show that your net profits are greater than those of any other people in proportion to the returns of this year, those totals fail to convince. We base our policy on facts, or, when they are interpreted, on figures. But facts and figures alike are not to be used as missiles at the hands of your opponents. They involve the careful consideration which you give to the gross total that comes back to you from your yearly enterprise. You require to know what are the deductions which have had to be made, at what cost it has been earned, what share of your expenses it must carry, and how it is likely to affect your business of the same character for the future.

But, gentlemen, it is not for me to detain you at this hour of the evening, by a discussion of business methods. I only wish to allude to them because our claim is substantially this—that business knowledge and business methods should be applied to business undertakings. Our nation in addition to being a great armed force, in addition to being a great civilising agency, in addition to being a great school of culture, is also a gigantic business enterprise ; and unless the business side of it be controlled and managed and directed on business principles, it cannot be maintained. You will remember the enormous handicaps with which your rivals commenced sixty years ago. When that Verbatim Report of the Conference does appear, if it ever does appear,—that is to say, if it appears in time to be used and criticised—even if it appears flung at you with its many different subjects mingled with each other in a gigantic Blue Book calculated to appal the stoutest hearts, we hope that you will take the pains to criticise our arguments and the replies which have been made to them, for we shall be happy to be confuted by better experience and to be guided by superior light. In the meantime we appeal to the record, and ask you to judge between us and those who have adopted a hostile view. We have maintained and will continue to maintain, that to fortify and extend commerce is one of the principal ends of government to-day. Our ancestors fought for it when they were building up this Empire. From Elizabethan days onwards the commerce of England has not only been the source of its strength, but the substance of many of its strifes. Our fathers thought our commerce worth fighting for with a strong hand. Do we not think it worth protecting by those means to which every other civilised people resorts ? Our circumstances differ, and doctrines have to bow to circumstances. We do not bring you

ready prepared any panacea of our own with a promise of a cure ; on the contrary that has to be adapted to and by ourselves. On that party issue—that local issue, I do not trespass. The fiscal policy of Great Britain waits upon the British people and upon the British circumstances. The conditions which profit us may fail altogether to yield you the same advantage. All we ask therefore, is the modest request to have a business method and a business principle applied to those dealings with each other, which are, or can be, made mutually profitable. We say that by those means we can do more, as Dr. Jameson said, than merely minister to self interest. I doubt if we are really doing more than ministering to self interest when we seek to rise for patriotic ends to the utmost term of our opportunities. For my part I cannot dissociate the welfare and prosperity of this Empire as a whole from the welfare and prosperity of each of its parts or any of its peoples. They appear to me to be indissolubly bound together. If you were to say to us as some of your representatives have said “ This proposal is wholly for your benefit and not at all for ours,” I have not made the reply, I do not propose to make it ; but I could have made it, that even if that were true, as long as it involved no injury to the United Kingdom, the benefit to us was a benefit to the Empire. That argument applies with exactly the same force when we come down to business propositions.

You will include in them no doubt, those which are of advantage to you, and some which are of no particular advantage to us, but it would then be our duty to say in a similar manner, “ This makes for the well-being of the Empire, and as such should be commended to all its sons.” What we have asked, and asked in vain, is that this question of commercial union should be brought to a practical stage. We hope it has been elucidated—Dr. Jameson says so ; he is a great authority, I would not dare to contradict him. I have not found it all round the Conference table. Jestings apart, however, I agree with Dr. Jameson most thoroughly when he says that although we may have failed in direct accomplishment, the indirect results of this Conference far more than repay us for our long journeys, far more repay us for our adjourned Parliaments and suspended administrations, with all that they involve to our affairs. They even help us to pay for the banquets we have sustained. What we desire to see, is the whole machinery of commercial life, with the whole forces of our public life systematically applied to the salutary task of building up the Unity of the Empire. In that scattered Empire closer commercial unity counts for a great deal. You may speak of commerce as indifferently as you please, but there is no commerce in the world, that is mere commerce, that is commercial only. It carries with it relations and opportunities ; it creates agencies

which are of enormous value for the growth of national life—it draws you closer to your own people, if not by the mere transaction itself, by other ties which it concurrently establishes in many directions. Why should the Empire which has the greatest commercial power in the world—and we hope we may always retain it—put aside a power no other nation shrinks from using? With their smaller capital, their smaller range they point with pride to policies by which they assert that they have built up their own present strength and standing. If they cannot judge them, who is to judge for them? Are we to be referred again to immutable law? Remember that, in spite of the enormous advantages of your equipment, in spite of your trained generations of business men, in spite of the high character of your artisans, and the progressive nature of this community, you have seen nations starting far below you in the scale in every one of those respects, making advances, which, in proportion, are greater than even you are making to-day.

Remember, gentlemen, that at the Conference we made an offer. The offer was respectfully declined. We asked that you should name your terms; again that was respectfully declined. Those who so declined, I have no desire in the least to impeach. But I state the facts. They mark a stage in the history of the conferences. For if these conferences are to fulfil their purpose, they will require to approach somewhat more closely, both in procedure and character to the debates which take place each day at Westminster. It will not suffice to wait for procrastinating Blue Books to learn long after what has been said or proposed. In the next conference—a conference without banquets—a conference not in a Parliamentary Session, meeting at a business time of the year, for business purposes, let the eyes of the United Kingdom be upon the representatives from over-seas—and incidentally upon their own representatives. Let the consideration of means and their adaptation to ends, be laid before you as they arise. Let no curtain interpose between the propositions before that Conference, the decision upon them, and the people who are, or ought to be, looking on. Let us hold them in the light of day. Who are those who escape the light of day? Is this evasion by immutable law? Then, Sir, we have gathered together to consider not merely questions of commerce, but all our great national issues, including the greatest, “National Defence.” What is it that we have to defend if it is not the commerce of the Empire? What else unites its parts? What else supplies it in time of peace? What else maintains it? What else sustains its sinews of war?

Is that great trade, protected by the whole forces of a United Empire, all its resources in men, money and arms—is that trade not to be permitted

to protect itself in time of peace against an aggression just as active, just as ceaseless, and, if it were to succeed, just as deadly an invasion as those of open war? Trade, as we understand it, is for mutual benefit, the benefit of both parties concerned; but if that trade is to be used for the benefit of one party only, if he is to impose his own conditions upon you, while you dare not impose your conditions upon him, where is the equality of trade? Where is true freedom of trade in the sense in which that phrase was originally understood?

But, Sir, I have detained you much too long although your goodness would excuse me, because this, after all, is a matter we have much at heart. We are here to-day at the Baltic, because it has been to occasions like this that we have been compelled to resort in order to endeavour to make ourselves understood in this country. We cannot wait upon a *précis*. We wish to realise from the first that our dominions came here no solicitors for alms, asking for nothing for which they were not prepared to give a fair and generous equivalent—inviting nothing on your part that was not approved by your judgment, and for your own national interests.* We met you, therefore, on a fair footing, with nothing to conceal, nothing to disguise, nothing to distrust. We are only anxious that we should be seen in that light, approaching you with outstretched hand, and keeping the hand still outstretched. We recognise that the present polite refusal is but temporary—is due to causes over which those who have made it have now no immediate control—that, at another time, under other circumstances, we may hope that either these means of Preference or those other means of Preference of so much moment to you, better and swifter sea-services, with cheaper freights and cheaper fares, cheaper cable communications, the lowering of dues upon shipping—British shipping—all these are necessary to be fostered by subvention, if not fed in other ways. Everything which improves these prolific agencies, everything which opens wider the channel to trade and commerce between us, everything which facilitates intercourse and multiplies the means of exchange is a Preference. That makes for the unity of the Empire. Although we met you on the footing of a business bargain, what dignifies the bargain, as Dr. Jameson said, is the aim of this particular bargain, and of all the other efforts associated with it. These efforts seek to establish on the firmest and broadest possible basis the unity of an Empire, which, by its mere existence, confers inestimable benefits on the meanest of its citizens—which holds on high to-day, as ever before, the torch of constitutional liberty—which has established institutions that other nations copy, though they all fail to copy your fiscal system—which keeps for you still in the world the pride of place. The last thing which we wish to see

you do, is to lay aside that crown. There are men whose voices we regret to hear, who seem to believe themselves appointed to be the official assignees of the British Empire—who are chiefly concerned with winding up its estates and distributing its assets. We only desire to enlarge and enrich the old firm. We propose a closer partnership, not the dissolution of the partnership that we now enjoy. That, thank heaven, we mean to maintain. To-day, even with our existing means, the blood which goes from the heart here in the United Kingdom to the further extremities of Empire and returns again, does so, not debilitated but invigorated by hope and faith in our national stock and national life. We believe in you, even if you do not believe in yourselves. We do not doubt you, even if you should doubt your own destiny. We are assured that, in spite of ancient doctrines as to immutable laws, the strength and substance of this nation remains, and within its limbs a force greater and more readily unloosed than ever before ; and that by its means you will retain, even if it be in spite of yourselves, the splendid place which our great forefathers won for us.

PROFESSOR ARTHUR DENDY

(1865-1925).

PROFESSOR ARTHUR DENDY, D.Sc., F.R.S., was the son of the Rev. John Dendy, B.A. He was born in 1865 and was educated at the Manchester Grammar School and afterwards at Owen's College, Manchester.

He began life by being assistant in the Zoological Department in the Natural History Section of the British Museum in 1887. Dendy then sailed for Australia to fill the post of Demonstrator and Assistant Lecturer in Biology in the University of Melbourne. After having filled a term of six years there, he accepted the offer of the professorship of Biology in the Canterbury College, University of New Zealand. Here the Professor worked incessantly for nine academic years, at the termination of which he left New Zealand for Africa in 1903. The next two years were spent as Professor of Zoology in the South African College, Cape Town, since which time Professor Dendy remained with King's College in the University of London.

Besides being a Fellow of the Royal Society and Doctor of Science, he was also an Hon. Member of the New Zealand Institute and Corresponding Member of the Royal Societies of Victoria and Tasmania.

THE STREAM OF LIFE

(Delivered at Edinburgh).

ALL typical organisms—animal or vegetable—are composed of cells ; minute nucleated masses of protoplasm, existing either singly or in many-celled aggregates. These cells are capable of reproducing themselves by a process of division, and each of the higher organisms, with certain negligible exceptions, starts its life in the condition of a single cell which we call an egg or ovum, or, to use a more general term, a germ-cell.

Whatever may have happened in the far-distant past, at the present-day, so far as we can see, every living thing is the product of some pre-existing living thing, the relation of parent and child holds good throughout the whole organic world, and when we come to analyse this relationship from the biological point of view we find that it is always

essentially based upon cell-division. Leaving out of account, as we may legitimately do for our present purposes, the stages of protoplasmic evolution that precede the appearance of the nucleated cell, we may say that the cell is the unit of organic structure, that all organisms are built up of such units in somewhat the same way as a house is built up of bricks, except that the process of building in the living organism is one of cell-growth and cell-multiplication, while the bricks of a house are brought together and combined into a building by some external agency. This fundamental conception of organic growth leads to the still more fundamental conception of living matter as a continuous stream of protoplasm, starting with the first appearance of life on the earth and continuing to the present day with undiminished vigour ; but it is a stream which in the process of time constantly branches out in new directions, giving rise ever to more complex and more diversified types of plants and animals. It is the stream of life.

When once the protoplasm of the egg, or germ-plasm, as it is technically termed, has developed into the mature tissues and organs of the adult body, it cannot, usually at any rate, be turned back again to germ-plasm ; it continues to live for a time but the stress and strain of life gradually exhaust its vitality ; for a time, tissues and organs may be renewed, but ultimately some essential part of the mechanism of the body is worn out beyond the possibility of repair, and the death of the entire organism inevitably follows.

What provision, then, is made for the next generation—who mixes the next batch of dough ? Here I am afraid our analogy breaks down, and it breaks down just because the germ-plasm, unlike the dough, is a living substance capable of increasing itself indefinitely by growth and multiplication. What happens is typically this—a part of the original germ-plasm of each generation is set aside, taking no share in the development of the body, but remaining in the condition of comparatively undifferentiated protoplasm, while continuing to increase and subdivide into germ-cells. It thus appears that the old idea that the hen produces the egg is scarcely correct—it seems that the egg produces the hen and at the same time more eggs, which are accidentally, as it were, included in the body of the hen. The constant succession of germ-cells, each produced by division of a parent cell, constitutes the only really continuous stream of living protoplasm. The bodies of individual plants and animals developing from the germ-cells may be compared to local and temporary overflows from the stream, which sooner or later dry up and disappear, or, in other words, die. This is Weismann's well-known doctrine of the "continuity of the germ-plasm," and for our present purposes we may take it as substantially correct, in principle if not in detail.

The simpler living organisms, which, like the amoeba, consist each of only a single cell, are exempt from death, because in them the stream of protoplasm forms no overflows; it consists entirely of germ-plasm, and no differentiated bodies are formed, so that there is nothing to die, nothing which cannot go on reproducing itself indefinitely. Death is the penalty paid for a higher life, based upon a greater complexity of bodily mechanism.

In all that has been said hitherto, which must be already very familiar to most of you, we have been endeavouring to pave the way for the consideration of what is perhaps the most difficult and certainly the most vigorously discussed problem of biology—the problem of heredity. With regard to the single celled organisms such as the amoeba this problem scarcely exists. Division of the parent cell entails division of all that that cell possesses. The daughter-cells resemble the mother simply because they are that mother divided into two equal and similar parts.

With the higher organisms, each composed, perhaps, of many millions of cells, differentiated into many different kinds, and building up the most diverse tissues and organs, the situation is very different. In such a case how can a single, apparently undifferentiated germ-cell, which has never taken part in the formation or in the activities of the body as a whole, and exhibits none of the features which characterise the tissue-cells—how can such a simple cell give rise by growth and multiplication to all the different kinds of cells, arranged in all the different tissues and organs, more or less exactly as in the parent?

The development of such an infinitely complex organism as, for example, the human body, from a microscopic egg-cell of apparently simple structure, seems, indeed, a kind of miracle, and the more closely we compare parent and child the more miraculous does the result appear, for not only is there a general resemblance in all essential features, but there is very frequently also a particular resemblance in minute peculiarities, such as the colour of the hair or eyes, the contour of the features, and so on.

It would be claiming far too much to say that we have as yet arrived at any complete explanation of heredity—this marvellously accurate reproduction in the child of the most minute details of bodily and mental organisation exhibited by the parent. But the explanation is, perhaps, after all, not quite so difficult as it seems at first sight. Let us go back to our loaves of bread and ask ourselves why one loaf resembles another. Why does the loaf that was baked on Tuesday resemble that which was baked in the same oven on Monday? The answer is obvious. One loaf resembles another because it is made from the same kind of dough and subjected to the same kind of treatment. If you take a different

kind of dough, or subject the same dough to a different treatment, you will get a different result—and, as every housewife knows, there may be a vast difference between the loaves turned out by different bakers. The characters of the loaf clearly depend upon two sets of conditions; first, the nature of the dough itself, whether, for example, it is mixed with yeast or baking powder, water or milk, salt or sugar, and so on; and, secondly, the nature of the treatment to which the dough is subjected, the shape of the tins in which it is baked, the temperature of the oven, and so forth. If all the conditions are accurately repeated for successive batches of loaves, then the loaves of each batch will resemble those of the preceding batch.

We have in this respect a very close analogy with what takes place in heredity. The egg consists of a certain quantity of germ-plasm and this germ-plasm has certain characteristic peculiarities of its own. In order that it may develop into an adult organism like the parent, it must be subjected to a certain treatment. In the case of a hen's egg undergoing incubation, or of the human foetus developing in the womb of the mother, we may truthfully say that it has to be baked in an oven at a particular temperature. Only if all the conditions are accurately fulfilled will the egg develop into an organism resembling the parent, and it does so simply because the same causes must always produce the same effects. If you start with identical germ-plasm and expose it to identical conditions during its development, you must get an identical result. The child must resemble the parent. It is, indeed, easy to show by experiment that if you vary the conditions you will get either no result at all or a different one. Up to a certain point, however, the living organism has the power of counteracting accidental influences, and thereby maintaining its normality of structure. In other words, it is self-regulating, and seems to be always endeavouring to carry out the plan of structure characteristic of the species to which it belongs, so that, if this plan be disturbed, it will, within limits, be restored again by appropriate growth and readjustment. This power of adhering to a predetermined structural plan, in spite of disturbing influences, is one of the most distinctive attributes of living beings, and must on no account be lost sight of in considering the problem of heredity; but at the same time it is a power that is strictly limited.

A well-known American investigator, Professor Stockard, has recently shown, in the case of various animals, how abnormalities can be produced by simply lowering the temperature during development. Some years ago the same observer obtained even more surprising results by the use of a simple chemical reagent. He exposed the eggs of the

American sea-minnow (*Fundulus*) to the action of magnesium chloride, and found that the young fish tended to develop with a single eye in the middle of the head, instead of one on each side, though the modification was not in all cases complete. Thus we see that it is possible, by the application of a specific chemical stimulus to the egg, to bring about a profound and perfectly definite change in the structure of the organism, though we are still far from knowing why this should be the case.

We also know, from recent physiological research, that the growth of various organs in the animal body is normally controlled by infinitesimal quantities of chemical substances secreted by the ductless glands, such as the thyroid and the pituitary, and circulated in the blood, and that any deficiency or excess of these substances may produce abnormal results. The discovery of these hormones, as they have been termed by Professor Starling, must have a profound influence on our ideas as to the mechanism of heredity. Their significance from this point of view was, I believe, first pointed out by Mr. J. T. Cunningham many years ago. It seems at least possible that chemical substances of a like nature may exist in the germ-cells and exercise a profound influence upon their development.

With this possibility in view, let us again examine the egg-cell at the very commencement of its development into a multicellular body, at the moment of its division into the first two daughter-cells, and let us concentrate our attention upon the nucleus, which always divides first. As it prepares itself for this important event a number of peculiar bodies called the chromosomes make their appearance, apparently by concentration of previously scattered granules of chromatin substance, so-called because of the way in which it can be stained by certain dyes. At the same time a spindle-shaped arrangement of threads becomes manifest and the nuclear membrane disappears, so that there is no longer any sharp division between nucleus and cell-body. The chromosomes, often varying in shape and size amongst themselves, but definite and constant for each kind of organism, arrange themselves across the middle of the spindle. Then each splits into two, and one half moves away from the other and towards the corresponding end of the spindle. We have now two groups of daughter chromosomes, and around each group a new nucleus is constituted. Then the protoplasm of the cell-body divides into two parts, and two complete cells are formed, each with its own nucleus.

The process is really far more complicated than this brief and inadequate description might lead you to suppose, but the essential feature seems always to be the behaviour of the chromosomes. It is very evident that the protoplasm of which they are composed must be of the

utmost importance to the organism, and that it is necessary that it should be very accurately divided between the daughter-cells every time cell-division takes place. This phenomenon of mitosis, as it is termed, is of almost universal occurrence throughout the animal and vegetable kingdoms, not only in the early divisions of the egg-cell, but throughout the entire life of the organism, whenever cell-division takes place. It is clearly a contrivance by which a certain material substance—a particular kind of living protoplasm—is accurately distributed amongst the progeny of a dividing cell. In other words, it is part of the mechanism of inheritance.

Let us now turn aside for a moment and glance very briefly at another and totally different line of evidence, leading to results which confirm and explain in a very remarkable manner those which we have already arrived at. I refer, of course, to the modern experiments in the breeding of plants and animals, undertaken under the influence of what is frequently termed the Mendelian school. It is utterly impossible to do justice to these wonderful experiments in the time at our disposal. I would point out, in the first place, however, that they have led quite independently to the striking conclusion that there must exist in the protoplasm of the germ-cells definite material entities—the so-called Mendelian factors—which are in some way or other responsible for the appearance in the adult organism of special features—the so-called unit characters—capable of being handed on from one generation to another by the process of heredity. Assuming them to be located in the chromosomes, the behaviour of these factors in inheritance, the permutations and combinations of unit characters which arise in cross-breeding, can be adequately explained by the behaviour of the chromosomes actually observed at certain critical periods of the life-cycle.

Take, for example, the colour of the human eye. If a certain factor, or combination of factors, alone be present in the germ-plasm, the eye will be blue or grey, but the addition of another factor may cause it to be brown, and the average results, as regards eye-colour, of mating pure blue-eyed and pure brown-eyed individuals can be confidently predicted. The occasional appearance of an extra thumb or finger upon the hand, which is well-known to be a heritable character, transmitted with great regularity from parent to child, is again supposed to be due to the occurrence of a corresponding factor in the germ-plasm, and so on with a whole host of characters that have been carefully investigated by means of breeding experiments in recent years. It is important to note that these characters seem to bear no purposeful relation whatever to the well-being of the organism in which they occur. They are often extremely insignificant, and a large proportion of them must undoubtedly be

regarded as abnormalities. It is a mere matter of chance whether they happen to be useful, neutral or injurious.

The investigations of Professor Morgan and his colleagues have gone so far as to demonstrate conclusively, albeit indirectly, not only that the Mendelian factors must be located in the chromosomes of the nucleus, but also that they must be arranged in each chromosome in a perfectly definite manner. These observers have even prepared maps of chromosomes showing the arrangement of the factors in linear series. It is surely one of the most remarkable achievements of modern science that we should be able to point to a particular spot in a particular chromosome of a microscopic germ-cell and say with confidence that there is something just there that is responsible for some particular character, such as the colour of the eye, in the adult organism.

As to the nature of the factors themselves, it seems not unreasonable to conclude that they must consist of definite chemical substances, or, perhaps better, of chemical modifications of living protoplasm, in the form of minute particles too small to be rendered visible by any means yet discovered, but capable of self-multiplication like other protoplasmic units.

We may further suppose that these factor-forming substances play a part in controlling the development of the organism comparable with that played by the magnesium chloride in the case of the developing embryos of the sea-minnow, or by other chemical substances (hormones) in the normal adult animal. The complex mechanism of mitosis in the division of the cell-nucleus would then appear to be necessary in order to secure the proper distribution of factors throughout the growing body, so that each may reach the particular part that it is destined to influence.

It must be remembered that the occurrence of Mendelian phenomena in heredity depends entirely upon a much more fundamental phenomenon—that of sex—which gives the experimenter the opportunity of crossing two individuals differing as to one or more separately heritable characters, and of observing the numerical proportions of the offspring in which each of these characters makes its appearance.

The phenomenon of sex, as we all know, is a very great mystery, and introduces endless complications into life. Sexual differentiation appears to be nearly as old as the cell itself. The stream of life, almost since it first began to flow, has been a double stream, or, better, a network, in which male and female streamlets unite at more or less frequent intervals to form those temporary overflows which we call individuals. Each streamlet goes its own way for a time, and then joins and exchanges experiences, so to speak, with another. It is just this exchange of

experiences that forms the basis of the Mendelian phenomena, and it is not merely the experiences of a single lifetime, but those of many generations that may be thus exchanged.

Perhaps, however, we are getting a little too metaphorical and had better consider in a rather more matter-of-fact manner what actually takes place in the sexual process. The essential feature of this process is always the same—the union of two germ-cells to form a single cell, although this fundamental act is greatly obscured in the higher plants and animals by the endless contrivances which have arisen in the course of evolution, and which serve the ultimate purpose of bringing the germ-cells together. In all the higher animals and plants these germ-cells are sharply differentiated into male and female, spermatozoa or sperm-cells and ova or egg-cells, and, with rare exceptions, the egg-cell cannot even begin to develop until it has united with, or, as we say, been fertilised by, a sperm-cell. This is very literally the union of two branches of the stream of life.

From the point of view of the theory of heredity, the most important thing about this union is the coming together of two sets of chromosomes—paternal and maternal—the one set coming with the spermatozoon from the male parent, and the other with the ovum from the female parent. The maternal and paternal chromosomes bring with them factors that have arisen in some unknown way, probably by chemical changes, in the two ancestral streams of protoplasm which unite in the fertilised egg. Apart altogether from the much-vexed question of the inheritance of “acquired” characters, which we cannot even touch upon this evening, these factors represent certain experiences which the stream of life has gathered in its journey.

Hence the new organism may exhibit certain characters derived from the father and others derived from the mother, a combination of paternal and maternal peculiarities, while the fundamental features of its organisation cannot be said to be derived from the one parent more than from the other. It will resemble either parent just in so far as it starts life with the same potentialities, inherent in the germ-plasm as a whole, and in its special factors, and just in so far as it develops under identical conditions. (We must not forget, though the point is not essential to our argument, that the germ-cells may perhaps contain other special factors besides those which have been located in the chromosomes).

It is a curious fact, and one upon which social reformers and preachers of equality would do well to reflect more seriously, that the characters, the potentialities for good or evil, of a living being should depend so much upon mere chance. A great deal can be done for the

welfare of the individual by improving the conditions under which it lives, as every gardener knows, but nothing can altogether counteract the effects of hereditary tendencies. It is worth while to consider a little more fully how it comes about that chance plays such an important part.

With certain exceptions, which do not affect the general proposition, every cell of the living organism contains, as we have already seen, a double set of chromosomes, one set derived from the male and the other from the female parent. The duplication takes place at the time when the two germ-cells come together to form the fertilised egg, but it is counteracted again by the reduction at another period of the life-cycle; otherwise the number of chromosomes in each cell would continue to increase in geometrical ratio from generation to generation, which is clearly impossible. It is at these two critical periods that chance steps in and prepares her surprises.

In the first place it seems to be purely a matter of chance what luck the germ-cells have in their mating, what particular ovum is fertilised by what particular spermatozoon, and, owing to the enormous numbers in which ova and spermatozoa are produced, the possibilities may be almost infinite. In the second place there are many alternative possibilities with regard to the particular factors which any given germ-cell, male or female, may contain. This depends upon which particular chromosomes happen to remain in the germ-cell after the double number has been halved again. In animals this halving takes place at the time when the germ-cells are ripening, shortly before they are ready to unite in the fertilised egg. The maternal and paternal chromosomes in each, differing as regards the factors they contain, pair off during the process of mitosis. The members of each pair then separate, and one of them alone remains in each mature germ-cell. Hence the germ-cells, even of the same individual, come to differ amongst themselves to a practically unlimited extent as regards their factorial constitution. The life of the individual is like a game of cards, in which a very great deal depends upon the shuffling of the pack, and the player has to do the best he can with the hand dealt out to him. He may make a hopeless failure of it, or a great success; but still the stream of life flows on, ever gathering and combining new experiences, ever forming itself into fleeting individualities and leaving them to perish on its banks as it passes on to fresh attempts at self-expression.

The interest of the Mendelian breeding experiments is so absorbing that it is little wonder if more fundamental aspects of the problem of heredity, to which we have alluded in the earlier part of our lecture, have been largely lost sight of in recent years, while the factorial

hypothesis has been hailed by some extremists as the all-sufficient explanation of everything. The characters of the organism may indeed be modified by factors in the germ-plasm, just as the character of a loaf may be modified by putting caraway seeds into the dough; but the caraway seeds do not explain the loaf, and the Mendelian factors cannot explain the organism as a whole. There is doubtless a good deal of truth in the old saying that life is made up of trifles; but it is not the whole truth, and the body of a living organism cannot be regarded as merely the sum-total of its unit characters.

Whatever may be their significance from the point of view of the general theory of evolution and heredity, however, there can be but one opinion as to the immense practical importance of the Mendelian investigations. They have already led to the production of many valuable forms of life, more especially plants, that are to all intents and purposes new creations, although their value and novelty may depend merely upon the bringing together of desirable characters in new combinations and the elimination of undesirable features.

Nor are the possibilities of improvement by selective mating confined to our domesticated plants and animals. Hopes are entertained by many enthusiasts, banded together in the interests of what they have thought fit to term the science of Eugenics, of effecting vast improvements in the human race itself by the application of Mendelian principles. It does not seem likely, however, or even desirable, that men and women should ever consent to be guided in their choice of mates by purely utilitarian considerations.

There are many objections to any far-reaching schemes of this kind, but it does seem possible, when once the facts of heredity are generally known, that the exercise of an enlightened public opinion and individual choice may result in the elimination from the stream of human life of many heritable characteristics which it is very undesirable to perpetuate. In extreme cases, such as feeble-mindedness and certain forms of insanity, it may even be necessary for the community to protect itself by legislation against the criminal propagation of the unfit.

What is wanted, first and foremost, however, is education, and I trust that you will agree with me that it is education in biology—the science of life—to which we may most hopefully look for the physical and mental improvement of the human race. Men and women must learn to realise their responsibilities towards future generations from the biological point of view, and it is in this direction that the citizens of a great city like Edinburgh can best help, by generously supporting the cause of education and research as represented by your ancient and world-famed University.

BIOLOGICAL FOUNDATIONS OF SOCIETY

(Delivered at King's College, London, 1923).

THE sharp distinction commonly drawn between mankind and the lower animals, rooted, so far as the western world is concerned, in the biblical fable of the creation, has, from the evolutionary standpoint at any rate, long ceased to be tenable as a logical antithesis. The light cast upon the origin of the human race by biological research has penetrated many dark places and left no shadow of justification for the old-fashioned dogmas of religious orthodoxy with regard to this important question. Indeed, orthodoxy itself has of late years found it necessary to abandon many of its old strongholds and seek a place more closely in touch with the advancing army of science.

This being the case it is indeed remarkable that, in what is usually regarded as one of the most enlightened countries of the world, a strong reaction should have set in quite recently against the doctrine of organic evolution, and that a vigorous attempt, which can only serve, in the long run, to defeat its own object, should actually be made by certain American politicians to prohibit the teaching of evolutionary biology. My distinguished colleague, Mr. Bateson, who considers himself to be the innocent striker of the spark that has kindled this belated conflagration, has recently summarised the position in a startling article in "Nature," from which I venture to quote the following passage: "In Kentucky a bill for suppressing all evolutionary teaching passed the House of Representatives, and was only rejected, I believe, by one vote, in the Senate of that state. In Arkansas the lower house passed a bill to the same effect almost without opposition, but the Senate threw it out. Oklahoma followed a similar course. In Florida the House of Representatives has passed, by a two-thirds vote, a resolution forbidding any instructor 'to teach or permit to be taught Atheism, agnosticism, Darwinism, or any hypothesis that links man in blood relation to any form of life.' This resolution was lately expected to pass the Senate. A melancholy case has been brought to my notice of a teacher in New Mexico who has been actually dismissed from his appointment for teaching evolution."

If Mr. Bateson is correct in his view, these remarkable and possibly disastrous results are the direct consequences of a discussion that took place a few years ago at a scientific meeting in Toronto, at which he,

while expressly and precisely proclaiming that his faith in evolution was unshaken, ventured to admit our ignorance as to actual modes and processes, especially as regards the origin of species. We need not concern ourselves now with this discussion, though I may perhaps be allowed to say that I think Mr. Bateson was unduly pessimistic and that the origin of species is by no means so insoluble a problem as it appears to him. But the doctrine of organic evolution does not depend upon the acceptance of any particular theory as to the manner in which evolution has led to the formation of those more or less arbitrary groups of plants and animals to which the term "species" is commonly applied.

This curious American revival of obscurantism makes it evident that the traditions and superstitions of centuries cannot be dispelled in any brief period, and that there is still much sentimental prejudice to be overcome before the great mass, even of partially educated men and women, can be expected to accept without reservation the essential unity of mankind with the rest of the animal kingdom. The prejudice is, of course, to a large extent excusable, for it is only by looking upward rather than downward, forward rather than backward, that we can hope to advance, and there seems at first sight to be something infinitely sordid and discouraging in tracing out the bestial affinities of the human race. Bestiality, however, is no reproach to the beast, and if we recognise it as such in ourselves it simply means that our path has really led us onwards, and justifies us in our hopes of future progress. The real danger is that evolutionary teaching might, perhaps, lead the less civilised members of society to regard the ancestry of the human race as an excuse for bestial behaviour. This is a danger that can be counteracted only by a rationalised insistence upon the spiritual side of man's nature, and in any case it is one that must be bravely faced in the interests of truth.

As my entire argument rests upon the evolutionary hypothesis and its application to mankind I may be excused for recapitulating very briefly some of the evidence by which our belief in that hypothesis is supported, though I am somewhat loth to take this course for fear of giving, in the limited space at our disposal, an altogether inadequate impression of the overwhelming strength of the case.

The human body, alike in its structure, functions and development, exhibits the most unmistakable traces of its pre-human ancestry, and of the common origin of mankind and the lower animals. Anatomically considered, and apart from the brain, the body of a man is actually less highly organised, a less complex and less specialised piece of mechanism,

than the bodies of many other vertebrates. The limbs in particular, in their typical five-fingered or five-toed structure, have retained a primitive character, and are far less advanced in evolution than the wings of a bird, or even the legs of a horse. The bird, as a flying animal, has an immense advantage over the man, and it is only at the present day, by the invention of flying machines, that man is beginning to make good this deficiency in his bodily organisation.

If we examine the wing of a bird, or the fore limb of a horse, however, in comparison with the human arm, we shall find that, in spite of their great difference in external appearance and mode of action, they all exhibit the same fundamental plan of structure. All can be derived from the primitive pentadactyl or five-fingered type characteristic of the whole of the air-breathing vertebrates. In all, we recognise the arm, supported by the humerus, the forearm with the radius and ulna, the wrist with its carpal bones, and the hand with its metacarpals and phalanges. The differences are due simply to exaggeration, suppression or fusion of these primitive constituents, and the only rational explanation of the fact that such different organs as arms, legs and wings exhibit essentially the same structural plan is that that plan has been inherited from some common ancestor, and adapted to the special requirements of each particular case.

So also with all the other organs of the human body, we find their counterpart, more or less exactly, in the bodies of other vertebrates, and it is only as regards details that we see any great variations in structure. There is, in short, one fundamental plan of organisation common to all the great group Vertebrata; a plan which comprises the dorsally situated central nervous system, differentiated into brain and spinal cord; the cranium or brain case surrounding the brain; the vertebral column, based upon the embryonic notochord and surrounding the spinal cord; the ventrally situated heart and the respiratory pharynx. These are all characteristic vertebrate features, but the vertebrate type itself is but a modification of a still more fundamental plan of organisation which the vertebrates share with some of the invertebrate classes. These latter again possess many features in common, while all of them, vertebrates and invertebrates alike, are, on microscopic analysis, found to be built up of essentially similar structural units—those microscopical, nucleated masses of protoplasm known as cells.

Amongst the Vertebrata we can distinguish five great classes, the Fishes, the Amphibians, the Reptiles, the Birds and the Mammals, which, at the present day, are fairly sharply marked off from one another.

although, when we trace their history backwards through geological time, we find them losing their distinctive features and gradually merging into one another.

The Fishes (amongst which we may, for the sake of simplicity, still include the lampreys) are undoubtedly the most primitive of these five classes, and in large measure represent the ancestral condition in which all the vertebrates originated. They are characterised above all by their thorough adaptation to an aquatic mode of life, entailing the possession of gills and branchial respiration throughout life, with corresponding arrangements of the heart and blood vessels, while their limbs retain the primitive form of fins, and have not acquired that pentadactyl structure which we have seen to be so characteristic of the air-breathing groups.

Next to the Fishes come the Amphibians, which still retain many fish-like features. Many of them, such as the common newts of our ponds and ditches, are still well adapted to an aquatic life, and some of them keep their gills as functioning organs of respiration throughout the whole of their existence. All of them, however, have developed lungs as out-growths of the oesophagus, comparable to the swim-bladder of certain fishes, but highly vascularised, and thus forming organs which are capable of breathing air directly. The arrangement of the heart and great blood-vessels becomes modified accordingly, while the primitive fish fin has been transformed into the five-toed limb adapted for locomotion on dry land. Even the frogs and toads, which, in the adult condition, depart so widely from the fish-like form and habit, pass through a very typical fish-like condition in their development—the active, free-living tadpole.

The Reptiles differ from the Amphibians in many important respects, but especially in their more complete adaptation to a terrestrial, air-breathing mode of life. At no period of their life-history do they possess gills; the lungs are the sole organs of respiration in the adult, and there is a further advance towards complete separation of the pulmonary from the systematic circulation. The free-living, fish-like larval stage has been completely suppressed, and the young animal, in its earlier stages, develops within an egg shell, where it is further protected by the sac-like amnion and nourished at the expense of the yolk stored up in the egg. The ancestral gills are replaced functionally, up to the time of hatching, by a new respiratory organ, the allantois, developed as a vascular outgrowth from the hinder part of the alimentary canal; but, strange to say, the gill slits in the neck still appear in the embryo, although they have entirely lost their original function.

From the reptilian stock two divergent lines of evolution have

originated, culminating in the Birds on the one hand and the Mammals on the other. The former have become highly specialised for a life of great activity in the air. In adaptation to this their fore limbs have been converted into wings, but their most distinctive peculiarity is the replacement of the reptilian scales, over the greater part of the body, by a covering of feathers, which serve both in the formation of the organs of flight and as a means of maintaining the characteristically high temperature of the body. The separation of the pulmonary and systematic circulations has been fully accomplished by the complete division of the heart into right and left sides which no longer communicate with one another. In their egg-laying habit, however, and in the early development of the young animal, they still agree very closely with their reptilian forefathers.

The mammals, on the other hand, have advanced along a very different path. Instead of feathers they have acquired a covering of hair as a protection against excessive changes of temperature, and this is perhaps their most obvious distinguishing feature, though the name of the group is derived from their unique habit of suckling the young. The great majority of mammals, moreover, differ from the ancestral reptiles in that they produce very minute eggs, without shell or yolk, which, for a longer or shorter period, develop within the womb of the mother; the young animal or foetus, up to the time of birth, being attached by a special organ, the placenta, to the parent. This very characteristic structure is formed mainly from the allantois, which has now taken on a nutritive as well as a respiratory function, absorbing nourishment by diffusion from the blood of the parent and conveying it to the foetus through the allantoic circulation.

Certain very primitive types of mammal, the Echidna or spiny anteater and the Ornithorhynchus or duck-billed platypus, have survived to the present day in Australia and some of the adjacent islands, and in these, although they possess a hairy covering and suckle their young in a very primitive fashion, many of the reptilian features that have been lost in the more typical members of the class still persist. Thus they lay large and heavily yolked eggs provided with egg shells, within which the early stages of development are passed outside the body of the parent, and there is of course no placenta.

Nowhere else amongst existing vertebrates do we meet with such an admirable example of a connecting link between two great classes as that afforded by these curious survivals, but we have only to search the record of the rocks to find parallel cases amongst the vertebrates of the past. The celebrated *Archæopteryx* of the Jurassic period, whose fossil remains occur in the lithographic slates of Solenhofen in Bavaria,

has long been known as a connecting link between the reptiles and the birds, occupying a position exactly analogous to that of *Echidna* and *Ornithorhynchus* between the reptiles and the mammals. In fact the geological evidence, now almost embarrassing in its abundance, entirely supports the conclusions derived from the comparative study of recent vertebrates as to the main lines of evolution within the group.

The order of appearance of the five great classes in geological time harmonises exactly with the theory that each great advance in organisation arose by modification of a pre-existing type; the fishes giving rise to amphibians, the amphibians to reptiles, and the reptiles to birds and mammals.

The origin of the vertebrate phylum as a whole is far less easy to trace—largely, no doubt, because it took place at such an extremely remote period of the earth's history—and it is not necessary for us to attempt to solve this problem. There can be no doubt, however, that the primitive vertebrates were derived from invertebrate ancestors and that the chain of life has been uninterrupted from the time of the first appearance of the simplest organisms to the present day.

There is one great law of progressive evolution which we may consider briefly at this preliminary stage of our inquiry, though we shall have to refer to it again later on. Each new branch of the evolutionary tree, marked by some characteristic modification of structure, arises, of course, from some parent branch, but it seldom or never springs from near the apex. In other words, it is not the more specialised members of an ancestral group that give rise to fresh outbursts of evolutionary vigour, but more lowly organised and primitive representatives, which have retained a high degree of plasticity and are able to adapt themselves to new environmental conditions. This great principle is very clearly illustrated in the case of the five classes of vertebrate animals. Comparative anatomy and palæontology concur in teaching us that the amphibians arose from fishes of primitive type and not from the highly specialised forms that dominate the seas to-day; that the reptiles arose from primitive amphibians and not from frogs or toads; and that birds and mammals in their turn sprang from primitive reptiles. Each great group, after giving off one or more vigorous offshoots in this manner, seems to exhaust itself in highly specialised experiments, which lead in the course of time to extinction.

This is nowhere better seen than in the history of the reptiles, which, after giving off the main stems of the birds and mammals about the commencement of the secondary period of the earth's history, branched out into numerous lines of descent which became highly specialised in adaptation to a great variety of conditions; crawling or walking on the

land, swimming in the sea, or even flying in the air, and often attaining gigantic dimensions. Most of these lines are now extinct and their place has been taken by the mammalian and avian descendants of the primitive reptilian stock.

The same great principle is no less clearly seen in the history of mankind in relation to the remainder of the great mammalian class to which man belongs. We have already had occasion to notice that his bodily structure exhibits primitive features, especially as regards the limbs. In this respect he and the other members of the order Primates are far less specialised than most of the mammals, and it was the retention of this primitive, unspecialised limb structure that rendered possible the adaptation of the arms as prehensile organs, and the gradual assumption of the erect attitude and bipedal method of locomotion that followed upon an arboreal mode of life. It was this change of habit, and especially the increasing use of the hands in fashioning and grasping tools, that led, by way of greatly increased and diversified experience, to that extraordinary brain development that distinguishes mankind from all the lower animals and marks the commencement of a new evolutionary era.

Whatever view we may take as to the exact point at which the human stock branched off from the line of descent of the other primates—whether we regard man as a glorified ape or trace his direct ancestry further back to some more primitive lemuroid type such as *tarsius*, makes little difference to our present argument, and the experts in anthropology may be safely left to settle their controversies amongst themselves. For us it is sufficient to insist upon the unity of mankind with the rest of the animal kingdom. If further proof of this unity be needed it is to be found in the mode of development of the individual man, and it is perhaps worth while to consider briefly this aspect of the question.

In the days of our infancy, when a new arrival in the family circle suddenly disturbed the domestic harmony, our nurses would endeavour to satisfy our natural curiosity with some well-worn legend. The baby had been brought by a stork or dropped down the chimney by Santa Claus, or perhaps delivered by the postman with the morning letters. I would commend these remarkable statements to the earnest attention of the legislators of Florida and the other American states already mentioned, for they are exactly on all fours with the legend of the creation of Adam and Eve. Every instructed person, however, knows that a human being comes into the world by a slow and gradual process of evolution, and it is impossible for those who have conscientiously studied the evidence to doubt that the same is true of the human race.

Mankind, at any rate in civilised countries, is no longer in its infancy, and it is too late to attempt to impose upon rational men and women with legends that are suitable only for the nursery.

One of the most important generalisations as yet reached by biological science is that known as the Law of Recapitulation, which states that each individual organism, whether animal or plant, in its development from the egg, passes through a series of stages which more or less closely resemble the stages through which its ancestors passed, as adult organisms, in the course of their evolution. The ontogeny or individual life-history repeats the phylogeny or history of the race. We have already had occasion to refer to the tadpole stage in the life-history of the frog as reproducing, with considerable exactitude, the structure of the fish-like ancestor of the amphibia. There is no tadpole stage in man because the changes that have taken place in his method of feeding and protecting the young have rendered a free-living larval form unnecessary and even impossible. But if we examine a human foetus while it is still sufficiently young we shall find a series of transverse grooves in the neck which are unmistakably equivalent to the gill slits of the tadpole, and clearly point to some extremely remote fish-like condition. At this stage the human foetus has so much in common with those of other mammals that it would take an experienced embryologist to tell the difference between them, and, apart from the presence of the placenta, it bears an almost equally close resemblance to the embryos of the reptiles and birds. As we trace the development of all these embryos on towards the adult condition we find the differences between them becoming gradually more and more strongly marked as the distinguishing features of the groups to which they belong make their appearance; but if we trace it backwards we shall find that they all converge and meet, as it were, in a common starting point—the egg or ovum—for however much the eggs of the several groups may differ from one another in secondary features, such as the presence or absence of an egg shell and the amount of food yolk they contain, each is essentially a single cell, a single, nucleated mass of protoplasm. This egg may be interpreted as representing a unicellular ancestor, from which all the great multicellular groups of the animal kingdom have originated, while other descendants from the same primitive stock, of a more conservative character, have retained the single-celled condition to the present day and constitute the existing Protozoa.

Thus, while the study of comparative anatomy teaches that, organ for organ, even to comparatively small details, the human body shares a common plan of structure with other mammals, and, to a less extent only, with the lower vertebrates also, the study of embryology affords

still more conclusive evidence as to man's place in the animal kingdom and his pre-human ancestry. So far as it goes—and it is to be regretted that as yet it goes only for a comparatively short distance—the geological history of mankind entirely supports the same conclusions. Whatever may be the exact period assigned by geologists as that in which the ancestors of the human race first acquired the right to be regarded as men, there can be no doubt that the human stock represents the most recent offshoot of any importance from the great vertebrate phylum, and in spite of the present deficiency of fossil remains we may fairly hope for a somewhat more satisfactory series of connecting links in the near future. We shall, however, probably never have anything like a complete chain, because, at the commencement of his evolution as a distinct branch, primitive man had not yet become a dominant type, and doubtless existed in very small numbers and for the most part under conditions which rendered it unlikely that his remains would be preserved for the edification of future generations.

Briefly as we have been¹ obliged to deal with the evidence, we have perhaps said enough to justify us in the assumption that mankind, looked at as a part of the animal kingdom, must be subject to the same laws of evolutionary progress and retrogression as the lower animals. From this point of view the distinction between nature and man, between natural and artificial products and processes, however convenient it may be, cannot be justified, any more than a corresponding distinction between nature and insect, natural and of insect origin. From other points of view, no doubt, we see things differently, and the evolution of man's mental, if not of his moral qualities, goes far towards justifying us in placing him on a pedestal and according him special treatment. To this aspect of the question we shall return later on. Our immediate object will be to investigate the phenomena of evolution for the animal kingdom as a whole, with a view to determining the conditions that are conducive to well-being and progress and distinguishing them from those that tend in the opposite direction. In order to accomplish this object we must go back a very long way.

The human mind appears to be ever attempting to arrange the data with which it works in sharply defined categories, and undoubtedly this proceeding greatly facilitates the mental operations of the average man. Thus it seems only natural to draw a sharp distinction between the living and the not living, and to assume that as protoplasmic organisms cannot always have existed on the earth they must have made their appearance there at some definite time. The doctrine of the creation of the world, as enunciated in the book of Genesis, the theory of the spontaneous generation of living things by the sudden conversion

of inanimate matter into organisms such as exist at the present day, and the theory of the population of the earth by immigrant germs of life from some other planet, all arose in response to the demand of the human mind for some definite beginning. The inconsistency of this demand is at length recognised by the student of evolution. He realises the absurdity of seeking a fixed starting point for the evolutionary process and a definite commencement for life. He recognises that the hunt for the first living things is the pursuit of a will o' the wisp, and that there never were any first living things either on this earth or anywhere else.

The great lesson that the study of evolution teaches is that nature knows no beginnings but only change. Evolution is continuous; without beginning and, so far as we can see, without end, and organic evolution is inseparable from the evolution of the inorganic world.

Astronomers and geologists tell us that the planet on which we live was at one time so hot that the elements of which it is composed existed only in a gaseous condition. As it cooled it condensed and partially liquefied, and further cooling and condensation led to the formation of a solid crust, surrounding a core which is still intensely hot and at any rate partially liquid, and surrounded by an atmosphere composed of certain constituents that remain gaseous at comparatively low temperatures. When the temperature had fallen sufficiently to allow of the condensation of aqueous vapour in this atmosphere, rivers began to flow and lakes and oceans to accumulate. It was then that the existence of living things on the earth's surface gradually became possible.

All along a process of evolution must have been going on amongst the constituents of which the cooling earth was composed. Chemical changes—combinations and decompositions of all kinds—were constantly taking place in strict accordance with the physical conditions existing for the time being, and it was doubtless the chemical reactions between the more superficially placed constituents of the earth's crust and the surrounding atmosphere, in the watery medium provided by the condensation of the aqueous vapour, and under the influence of the sun's rays, that led, slowly but surely, to the formation of that curious substance which we call protoplasm—a substance that occurs in the bodies of all living organisms and in the absence of which life—as the biologist understands it—is unknown.

The actual stages that led up to the formation of protoplasm as soon as the conditions at the surface of the cooling earth became suitable are unknown to us. We are equally ignorant as to whether the process may have taken place once or many times. It was, of course, a kind.

of spontaneous generation, but a spontaneous generation by slow and gradual evolution of the inorganic into the organic, and very different from the sudden conversion of inanimate matter into more or less highly organised plants and animals that has so often been imagined. So far as we can yet see, living organisms are never produced in this way at the present day, but always arise as the offspring of living parents.

It is the chemical and physical reactions between the protoplasmic organism and its environment that constitutes what we call the "life" of the organism, and the more intense and varied these reactions are the more intense and varied will be the life. I am speaking now of life from the purely mechanistic point of view, but I do not wish to be understood as suggesting that this is the only point of view, or even that it is the most satisfactory point of view, though perhaps it is the only one that a scientific man, as such, can safely adopt, for it is the only one that gives a chance of investigation by purely scientific methods. It is, however, by no means irreconcilable with the views of those who hold that the spiritual aspect of the universe is no less real and no less important than the material. Life, it is true, appears to the pure mechanist to consist entirely of chemical and physical processes, but this may be merely because these are the only processes that are accessible to investigation by the very limited means at his disposal. However it may be with the lower forms of living matter, the case against pure mechanism appears to be conclusive when we come to consider the phenomena of consciousness and thought exhibited by human beings, and the biologist cannot stultify himself by admitting any breach of continuity between the simplest and the most complex of living things.

It would seem, then, that as the chemical evolution of certain carbon compounds progressed they slowly acquired those properties which we regard as distinctive of living beings, though we can by no means say at what particular point they first became alive, for the transition from the not-living to the living condition must have been perfectly gradual. Amongst the properties that are more especially characteristic of protoplasmic organisms is the power of taking in food material from the environment. This not only furnishes fresh supplies of energy but, inasmuch as the food material may be converted by chemical processes into new protoplasm, it leads to growth. Growth, however, is not continuous, but sooner or later results in the multiplication of protoplasmic units, and thus the swelling stream of living matter becomes broken up into individual organisms, each capable of reproducing its own kind, but always liable to further modification, which leads on the whole to ever-increasing complexity of structure—though under certain exceptional conditions the evolutionary process

may be reversed and result in simplification. In this way we believe that the innumerable host of living things that to-day people the earth in all their endless variety has slowly and gradually come into being, the stream of life constantly branching out in new directions and the individual organisms adapting themselves in structure and function to every situation in which the maintenance of life is possible.

Amongst the more important factors that contribute towards the highly complex process of organic evolution we may safely give precedence to the power of the living protoplasm to respond to stimuli—that is, to exhibit some change in behaviour as the result of some change in the surrounding conditions, or environment, both being of a more or less definite character. Even comparatively simple organisms, like the Amoeba, which look like microscopic specks of semi-transparent jelly, though in reality having a very complex structure, respond quite definitely to such stimuli as contact, light, heat, electricity and chemical action, contracting themselves into balls or changing the direction of their movements as the case may be. Similarly, in the higher plants, a root responds to the stimulus of gravity by growing downwards and a shoot by growing upwards. Not only does the complete organism, or its individual organs, respond in this manner, but the actual building up of its structure, as it develops from the egg, is determined in the same way. The protoplasmic cells divide and their products arrange themselves under the influence of the appropriate stimuli, and if these stimuli be changed beyond narrow limits the change will inevitably be reflected in the structure of the organism. Thus the growth and differentiation of a plant or an animal are merely expressions of its behaviour under the influence of specific stimuli, and the result is to be attributed ultimately to the responsive power of the living protoplasm, a power that seems to be quite capable of explanation in terms of chemical and physical science.

But the living protoplasm is not only capable of responding to stimuli, it is also capable of learning by experience and thus making its responses more and more prompt and accurate each time they are repeated. In other words, it can be educated and can establish habits. According to the experiments of Professor Jennings this power of learning by experience can be recognised even in the unicellular organisms, and it must, I think, be regarded as a fundamental property of living matter.

Perhaps the most potent stimulus that acts upon the living organism is that of hunger, which leads it to take in food from the external world, and with it fresh supplies of energy, making good what has been dissipated in its various activities and providing the material necessary

for growth and reproduction. Hunger is an internal stimulus, arising within the organism itself, and when it is supplemented by the stimuli provided by the presence of suitable food material the organism makes the appropriate response, captures or absorbs the food and incorporates it in its own body, there to undergo the processes of digestion and assimilation. In ultimate analysis, of course, the act of feeding, even in the higher animals, is performed by all the constituent protoplasmic units, or cells, of which the body is composed, just as it is performed by free-living unicellular organisms such as the *Amoeba*.

The living organism, then, whether it be a single cell or a complex multicellular plant or animal, learns by repeated experience to obey ever more promptly what we call the feeding instinct. If food be abundant it may be taken in in excess of immediate requirements and stored up in some suitable form for future use. The fats, oils, starches and so forth, so commonly met with in the cellular tissues of plants and animals, and especially in eggs and seeds, constitute a reserve that can be drawn upon whenever the necessity arises, and this reserve represents so much surplus energy.

It is just this habit of accumulating surplus energy that has made progressive evolution possible. The parent organism accumulates a certain amount of capital which may, at any rate in part, be devoted to giving its offspring a better start in life. The methods by which this result is attained vary endlessly in detail, but the principle is always the same. In the animal kingdom, in the course of evolution, there has been a gradual improvement in the method of transmitting capital from parent to offspring. The first great discovery, so to speak, was the utilisation of the egg itself as a storehouse of food material transferred from the body of the parent. This method reaches its climax in the reptiles and birds. The chick embryo in a hen's egg is, indeed, an almost perfect example of a capitalist, and no one would think of calling it "bloated," for the accumulated capital is all required for perfectly legitimate and indeed necessary purposes.

The mammals, whose ancestors undoubtedly also laid large eggs, made two new departures in this respect, to which we have already had occasion to refer. In the first place they learnt to retain the young within the womb of the mother and feed it there by means of the blood circulation until it reached an advanced stage of development; and, concomitantly with this, they developed milk glands from the skin, and were thus enabled to continue the feeding process after the young were born. These two methods of transferring capital, or surplus energy, from one generation to the next have proved so successful that they have entirely superseded the older and more primitive method of the

birds and reptiles, and the mammalian egg, being no longer used largely as a storehouse for reserve food material, has now reverted to the microscopic size that seems more consistent with its character as a single cell.

It seems sufficiently obvious that the habit of accumulating capital for the benefit of the next generation must lead to progressive evolution, for each successive generation, on the average, gets a slightly better start in life than its predecessor and is thus enabled to carry on its individual development a little further. This conclusion is not open to the objections that have, rightly or wrongly, been urged against Lamarck's theory of the gradual adaptation of the organism to its environment through the inheritance of acquired characters, for whether the supplies of energy be accumulated in the egg cell in the form of yolk and albumin, or whether they be transferred from parent to offspring by the processes of gestation and lactation, we are able to demonstrate quite clearly the means by which the accumulation is handed on. Unless something occurs to prevent it, it must continue to increase like a sum of money at compound interest, and each generation, in virtue of the inherited experience of its living protoplasm, will tend to accumulate more rapidly than its predecessor.

The mere accumulation of surplus energy cannot, of course, determine particular lines of evolution; it supplies, so to speak, only the motive power that renders progress possible. What it is that directs this progress so as to ensure the close adaptation of the organism to the conditions under which it has to live is another question.

It seems, then, that the accumulation of capital, which is simply another name for surplus energy, is no mere human invention, but an essential condition of progress throughout the organic world. So also is the transmission of capital from parent to child. The great principle involved in capitalism is, perhaps, as old as life itself; it is only the abuse of that principle that has been reserved for mankind.

There is one other primary factor of organic evolution that is at least as old as capitalism, and that is work, for capital and labour have been co-operating ever since the beginning of things, and neither can do without the other. We have already seen that life, from the biological point of view, consists in the constant interchange of energy between the organism and its environment. The organism takes in energy in the form of food and expends it in a great variety of ways in overcoming the antagonism of its surroundings. Now if we define work as the expenditure of energy, which seems to be the only satisfactory definition, it follows immediately, not only that life is dependent on work, but that life and work are in reality one and the same thing, or, to put it more accurately, that life is nothing but work of a particular and very complex

kind. The higher the type of organism the more complex is the work in which its life consists and the greater are its capacities for good and evil, pleasure and pain.

It is clear, then, that every living thing must work for its living, for the cessation of work means death. We cannot even attempt to distinguish scientifically between workers and non-workers without realising at once that the non-workers are all dead and that there can be no need for us to trouble ourselves any further about them.

LORD ERSKINE

(1750-1823).

WHEN Erskine appeared in his first case (that of *King versus Baillie*), he himself was probably the only man in England who thought his talents as a lawyer worth considering. When he left the court room, however, where he had spoken as the junior of five counsel, he was already near the head of the English bar, and it is said he received thirty retainers before he was out of the building. Compared to his more mature efforts, this speech would hardly be worth notice, did it not illustrate both the spirit and method which made him the greatest forensic orator of his day. At a time when it was a highly dangerous offence to "scandalize the great," it was the rule to find humble scapegoats to bear the odium of the sins of power. Neither the King nor his ministers were to be mentioned except with the usual "Far be it from me"—but Erskine, reviewing the question presented by the pamphlet in which Captain Baillie had charged Lord Sandwich, first lord of the admiralty, with responsibility for abuses at Greenwich Hospital made an attack on Sandwich so bold that he at once compelled attention to himself as the central figure of the trial. From this beginning, Erskine was concerned in one after another of those great causes, through which the right of the people to sit in judgment on the acts of all who exercise their delegated power was asserted and at last vindicated. Under the Georges, prosecution for "seditious libel" took the place of what might have been arrests for treason under the Stuarts. In such cases as in that of Hardy and others for treason itself, Erskine was moved by the *liberrima indignatio* of the man who feels as his own every wrong with which power threatens weakness. This intensity gave him his power and his celebrity. In such cases as that of Lord George Gordon where he is forcible to the last degree, he does not compel any other interest than that which attaches to the subject itself. This is true of some others of his orations in what were great political trials, but his peroration in the case of Stockdale is made sublime by the strength of his protest against the injustice of holding Warren Hastings as worse than the policy he was sent to India to enforce. His speech

prosecuting the publisher of Thomas Paine's 'The Age of Reason,' which he himself considered his masterpiece, is, undoubtedly, very eloquent, and, from his standpoint, not inconsistent with his defence of 'The Rights of Man.' The speech against 'The Age of Reason' was published and circulated in immense numbers by the Society for the Suppression of Vice,—“which gave me the greatest satisfaction,” Erskine writes, “as I would rather that all my other speeches were committed to the flames, or in any manner buried in oblivion, than that this single speech should be lost.”

Erskine had no such mastery of metaphor as Curran showed in comparing the smile of a man he detested to “the shine of a coffin plate,” but few orators rise more strongly than he to a climax, and few other speeches in English are so well sustained as his.

He was born at Edinburgh, January 21st, 1750. His father, the Earl of Buchan, whose youngest son he was, was practically bankrupt, and could not give him a university education. After service first in the Navy and then in the Army,*Erskine went to London, and in 1775, began to fit himself for the Bar by entering as a student at Lincoln's Inn and a little later by entering himself as a gentleman commoner at Trinity College, Cambridge. He suffered considerable hardship during this period of his career, but it is said that in four years after his admission to the Bar, he had paid all his debts and cleared nine thousand pounds. In 1783, he was elected Member of Parliament for Portsmouth, but his first speech was a failure, and he never succeeded as a parliamentary orator. His success at the Bar was so brilliant that he was made Attorney-General to the Prince of Wales—an office from which he was removed for defending Thomas Paine. He was raised to the peerage as Baron Erskine, however, and under Lord Grenville, became Chancellor of England. His decisions in that capacity have been called “the Apocrypha” by those who deny that he was a great lawyer. While his legal attainments have not lacked eulogists, his strongest characteristic was not so much deep learning in the detail of law as deep sympathy with its underlying principles of justice and liberty. This made him a greater force for after times than Mansfield or Ellenborough. He died November 17th, 1823.

FREE SPEECH AND FUNDAMENTAL RIGHTS

(The Argument on behalf of Thomas Paine at his Trial for Libel).

I SAY, in the name of Thomas Paine, and in his words as author of 'The Rights of Man,' as written in the very volume that is charged with seeking the destruction of property :—

“The end of all political associations is, the preservation of the rights of man, which rights are liberty, property, and security ; that the nation is the source of all sovereignty derived from it ; the right of property being secured and inviolable, no one ought to be deprived of it, except in cases of evident public necessity, legally ascertained, and on condition of a previous just indemnity.”

These are undoubtedly the rights of man—the rights for which all governments are established—and the only rights Mr. Paine contends for ; but which he thinks (no matter whether right or wrong) are better to be secured by a republican constitution than by the forms of the English Government. He instructs me to admit that, when government is once constituted, no individuals, without rebellion, can withdraw their obedience from it,—that all attempts to excite them to it are highly criminal, for the most obvious reasons of policy and justice,—that nothing short of the will of a whole people can change or affect the rule by which a nation is to be governed,—and that no private opinion, however honestly inimical to the forms or substance of the law, can justify resistance to its authority, while it remains in force. The author of ‘The Rights of Man’ not only admits the truth of all this doctrine, but he consents to be convicted, and I also consent for him, unless his work shall be found studiously and painfully to inculcate these great principles of government which it is charged to have been written to destroy.

Let me not, therefore, be suspected to be contending that it is lawful to write a book pointing out defects in the English Government, and exciting individuals to destroy its sanctions and to refuse obedience. But, on the other hand, I do contend that it is lawful to address the English nation on these momentous subjects ; for had it not been for this inalienable right (thanks be to God and our fathers for establishing it !), how should we have had this constitution which we so loudly boast of ? If, in the march of the human mind, no man could have gone before the establishments of the time he lived in, how could our establishment, by reiterated changes, have become what it is ? If no man could have awakened the public mind to errors and abuses in our Government, how could it have passed on from stage to stage, through reformation and revolution, so as to have arrived from barbarism to such a pitch of happiness and perfection, that the Attorney-General considers it as profanation to touch it further, or to look for any future amendment ?

In this manner power has reasoned in every age :—government, in its own estimation, has been at all times a system of perfection ; but a free press has examined and detected its errors, and the people have, from time to time, reformed them. This freedom has alone made

our Government what it is ; this freedom alone can preserve it ; and therefore, under the banners of that freedom, to-day I stand up to defend Thomas Paine. But how, alas ! shall this task be accomplished ? How may I expect from you what human nature has not made man for the performance of ? How am I to address your reasons, or ask them to pause, amidst the torrent of prejudice which has hurried away the public mind on the subject you are to judge ? . . .

Was any Englishman ever so brought as a criminal before an English court of justice ? If I were to ask you, gentlemen of the jury, what is the choicest fruit that grows upon the tree of English liberty, you could answer : Security under the law. If I were to ask the whole people of England the return they looked for at the hands of Government, for the burdens under which they bend to support it, I should still be answered : Security under the law ; or, in other words, an impartial administration of justice. So sacred, therefore, has the freedom of trial been ever held in England—so anxiously does Justice guard against every possible bias in her path, that if the public mind has been locally agitated upon any subject in judgment, the forum has either been changed, or the trial postponed. The circulation of any paper that brings, or can be supposed to bring, prejudice, or even well-founded knowledge, within the reach of a British tribunal, on the spur of an occasion, is not only highly criminal, but defeats itself, by leading to put off the trial which its object was to pervert. On this principle, the noble and learned judge will permit me to remind him that on the trial of the Dean of St. Asaph for a libel, or rather when he was brought to trial, the circulation of books by a society favourable to his defence was held by his lordship, as chief-justice of Chester, to be a reason for not trying the cause, although they contained no matter relative to the Dean, nor to the object of his trial, being only extracts from ancient authors of high reputation, on the general rights of juries to consider the innocence as well as the guilt of the accused ; yet still as the recollection of these rights was pressed forward with a view to affect the proceedings, the proceedings were postponed. . . .

The universal God of Nature,—the Saviour of Mankind,—the Fountain of all Light, who came to pluck the world from eternal darkness, expired upon a cross,—the scoff of infidel scorn ; and His blessed Apostles followed Him in the train of martyrs. When He came in the flesh, He might have come like the Mohammedan Prophet, as a powerful sovereign, and propagated His religion with an unconquerable sword, which even now, after the lapse of ages, is but slowly advancing under the influence of reason, over the face of the earth ; but such a process would have been inconsistent with His mission, which was to confound the pride and to

establish the universal rights of men ; He came, therefore, in that lowly state which is represented in the Gospel, and preached His consolations to the poor.

When the foundation of this religion was discovered to be invulnerable and immortal, we find political power taking the Church into partnership ; thus began the corruptions both of religious and civil power, and, hand in hand together, what havoc have they not made in the world ! Ruling by ignorance and the persecution of truth, this very persecution only hastened the revival of letters and liberty. Nay, you will find that in the exact proportion that knowledge and learning have been beat down and fettered, they have destroyed the governments which bound them. The Court of Star Chamber, the first restriction of the press of England, was erected, previous to all the great changes in the Constitution. From that moment, no man could legally write without an imprimatur from the State ; but truth and freedom found their way with greater force through secret channels, and the unhappy Charles, unwarned by a free press, was brought to an ignominious death. When men can freely communicate their thoughts and their sufferings, real or imaginary, their passions spend themselves in air, like gunpowder scattered upon the surface ; but pent up by terrors, they work unseen, burst forth in a moment, and destroy everything in their course. Let reason be opposed to reason, and argument to argument, and every good government will be safe.

The usurper Cromwell pursued the same system of restraint in support of his government, and the end of it speedily followed.

At the restoration of Charles II., the Star Chamber Ordinance of 1637 was worked up into an act of Parliament, and was followed up during that reign, and the short one that followed it, by the most sanguinary prosecutions ; but what fact in history is more notorious than that this blind and contemptible policy prepared and hastened the revolution ? At that great era these cobwebs were all brushed away ; the freedom of the press was regenerated,—and the country ruled by its affections, has since enjoyed a century of tranquillity and glory. Thus I have maintained, by English History, that in proportion as the press has been free, English Government has been secure.

Gentlemen, the same important truth may be illustrated by great authorities. Upon a subject of this kind, resort cannot be had to law cases. The ancient law of England knew nothing of such libels ; they began, and should have ended, with the Star Chamber. What writings are slanderous of individuals must be looked for where these prosecutions are recorded ; but upon general subjects we must go to general writers. If, indeed, I were to refer to obscure authors, I might be answered, that my

very authorities were libels, instead of justifications or examples ; but this cannot be said with effect of great men, whose works are classics in our language,—taught in our schools,—and repeatedly printed under the eye of Government.

I shall begin with the poet Milton, a great authority on all learning. It may be said, indeed, he was a republican, but that would only prove that republicanism is not incompatible with virtue ; it may be said, too, that the work which I cite was written against previous licensing, which is not contented for to-day. But, if every work were to be adjudged a libel, which was adverse to the wishes of Government, or to the opinions of those who may compose it, the revival of a licenser would be a security to the public. If I present my book to a magistrate appointed by law, and he reject it, I have only to forbear from the publication ; in the forbearance I am safe ; and he, too, is answerable to the law for the abuse of his authority. But, upon the argument of to-day, a man must print at his peril, without any guide to the principles of judgment, upon which his work may be afterwards prosecuted and condemned. Milton's argument, therefore, applies, and was meant to apply, to every interruption to writing, which, while they oppress the individual, endanger the State.

“ We have them not,” says Milton, “ that can be heard of, from any ancient state, or polity, or church, nor by any statute left us by our ancestors, elder or later, nor from the modern custom of any reformed city or church abroad, but from the most anti-Christian council and the most tyrannous inquisition that ever existed. Till then, books were ever as freely admitted into the world as any other birth ; the issue of the brain was no more stifled than the issue of the womb.

“ To the pure all things are pure ; not only meats and drinks, but all kinds of knowledge whether good or evil ; the knowledge cannot defile, nor consequently the books, if the will and conscience be not defiled.

“ Bad books serve in many respects to discover, to confute, to forewarn, and to illustrate. Whereof, what better witness can we expect I should produce than one of your own, now sitting in Parliament, the chief of learned men reputed in this land, Mr. Seldon, whose volume of natural and national laws, proves, not only by great authorities brought together, but by exquisite reasons and theorems almost mathematically demonstrative, that all opinions, yea errors known, read, and collated, are of main service and assistance toward the speedy attainment of what is truest.

“ Opinions and understanding are not such wares as to be monopolized and traded in by tickets and statutes and standards. We must

not think to make a staple commodity of all the knowledge in the land, to mark and licence it like our broadcloth and our wool-packs.

"Nor is it to the common people less than a reproach ; for if we be so jealous over them that we cannot trust them with an English pamphlet, what do we but censure them for a giddy, vicious, and ungrounded people, in such a sick and weak state of faith and discretion, as to be able to take nothing down but through the pipe of a licenser ? That this is care or love of them, we cannot pretend.

"Those corruptions which it seeks to prevent, break in faster at doors which cannot be shut. To prevent men thinking and acting for themselves by restraints on the press, is like to the exploits of that gallant man who thought to pound up the crows by shutting his park gate.

"This obstructing violence meets for the most part with an event utterly opposite to the end which it drives at ; instead of suppressing books it raises them, and invests them with a reputation : ' the punishment of wits enhances their authority,' saith the Viscount St. Albans ; and a forbidden writing is thought to be a certain spark of truth that flies up in the face of them who seek to tread it out."

He then adverts to his visit to the famous Galileo, whom he found and visited in the Inquisition, "for not thinking in astronomy with the Franciscan and Dominican monks." And what event ought more deeply to interest and affect us ? The very laws of nature were to bend under the rod of a licenser ;—this illustrious astronomer ended his life within the bars of a prison, because, in seeing the phases of Venus through his newly-invented telescope, he pronounced that she shone with borrowed light, and from the sun as the centre of the universe. This was the mighty crime, the placing of the sun in the centre—the sun which now inhabits it upon the foundation of mathematical truth, which enables us to traverse the pathless ocean and to carry our line and rule amongst other worlds, which but for Galileo we had never known, perhaps even to the recesses of an infinite and eternal God.

Milton, then, in his most eloquent address to the Parliament, puts the liberty of the press on its true and most honourable foundation :—

"Believe it, lords and commons, they who counsel ye to such a suppression of books do as good as bid you suppress yourselves, and I will soon show how.

"If it be desired to know the immediate cause of all this free writing and free speaking, there cannot be assigned a truer than your own mild, and free, and humane Government. It is the liberty, lords and commons, which your own valorous and happy counsels have purchased us ; liberty, which is the nurse of all great wits ; this is that which hath rarefied and enlightened our spirits like the influence of heaven ; this is that

which hath enfranchised, enlarged, and lifted up our apprehensions, degrees above themselves. Ye cannot make us now less capable, less knowing, less eagerly pursuing the truth, unless ye first make yourselves, that made us so, less the lovers, less the founders of our true liberty. We can grow ignorant again, brutish, formal, and slavish, as ye found us ; but you then must first become that which ye cannot be, oppressive, arbitrary, and tyrannous, as they were from whom ye have freed us. That our hearts are now more capacious, our thoughts now more erected to the search and expectation of greatest and exactest things, is the issue of our own virtue propagated in us. Give me the liberty to know, to utter, and to argue freely according to conscience, above all liberties."

But now every man is to be cried down for such opinions. I observed that my learned friend significantly raised his voice in naming Mr. Horne Tooke, as if to connect him with Paine, or Paine with him. This is exactly the same course of justice, for, after all, he said nothing of Mr. Tooke. What could he have said, but that he was a man of great talents, and a subscriber with the great names I have read in proceedings which they have thought fit to desert ?

Gentlemen, let others hold their opinions and change them at their pleasure ; I shall ever maintain it to be the dearest privilege of the people of Great Britain to watch over everything that affects their happiness, either in the system of government or in the practice, and for this purpose the press must be free. It has always been so, and much evil has been corrected by it. If Government find itself annoyed by it, let it examine its own conduct, and it will find the cause,—let it amend it, and it will find the remedy.

Gentlemen, I am no friend to sarcasms in this discussion of grave subjects, but you must take writers according to the view of the mind at the moment ; Mr. Burke as often as anybody indulges in it :—hear his reason in his speech on Reform, for not taking away the salaries from lords who attend upon the British court. " You would," said he, " have the court deserted by all the nobility of the kingdom."

" Sir, the most serious mischiefs would follow from such a desertion. Kings are naturally lovers of low company ; they are so elevated above all the rest of mankind, that they must look upon all their subjects as on a level ; they are rather apt to hate than to love their nobility on account of the occasional resistance to their will, which will be made by their virtue, their petulance, or their pride. It must, indeed, be admitted that many of the nobility are as perfectly willing to act the part of flatterers, talebearers, parasites, pimps, and buffoons, as any of the lowest and vilest of mankind can possibly be. But they are not properly qualified for this object of their ambition. The want of a regular education

and early habits, with some lurking remains of their dignity, will never, permit them to become a match for an Italian eunuch, a mountebank, a fiddler, a player, or any regular practitioner of that tribe. The Roman Emperors, almost from the beginning, threw themselves into such hands, and the mischief increased every day until its decline and its final ruin. It is, therefore, of very great importance (provided the thing is not overdone), to contrive such an establishment as must, almost whether a prince will or not, bring into daily or hourly offices about his person a great number of his first nobility ; and it is rather a useful prejudice that gives them a pride in such a servitude ; though they are not much the better for a court, a court will be much the better for them. I have, therefore, not attempted to reform any of the offices of honour about the King's person."

What is all this but saying that a king is an animal so incurably addicted to low company as generally to bring on by it the ruin of nations ; but, nevertheless, he is to be kept as a necessary evil, and his propensities bridled by surrounding him with a parcel of miscreants still worse, if possible, but better than those he would choose for himself. This, therefore, if taken by itself, would be a most abominable and libellous sarcasm on kings and nobility ; but look at the whole speech, and you observe a great system of regulation ; and no man, I believe, ever doubted Mr. Burke's attachment to monarchy. To judge, therefore, of any part of a writing, the whole must be read.

With the same view I will read to you the beginning of Harrington's 'Oceana' ; but it is impossible to name this well-known author without exposing to just contempt and ridicule the ignorant or profligate misrepresentations which are vomited forth upon the public, to bear down every man as desperately wicked, who, in any age or country, has countenanced a republic, for the mean purpose of prejudging this trial.

Is this the way to support the English Constitution ? Are these the means by which Englishmen are to be taught to cherish it ? I say, if the man upon trial were stained with blood instead of ink,—if he were covered over with crimes which human nature would start at the naming of, the means employed against him would not be the less disgraceful.

For this notable purpose, then, Harrington, not above a week ago, was handed out to us as a low, obscure wretch, involved in the murder of the monarch and the destruction of the monarchy, and as addressing his despicable works at the shrine of a usurper. Yet this very Harrington, this low blackguard, was descended (you may see his pedigree at the Herald's office for sixpence) from eight dukes, three marquises, seventy earls, twenty viscounts, and thirty-six barons, sixteen of whom were

knights of the garter ; a descent which, I think, would save a man from disgrace in any of the circles of Germany. But what was he besides ?—a blood-stained ruffian ?—Oh, brutal ignorance of the history of the country ! He was the most affectionate servant of Charles I., from whom he never concealed his opinions ; for it is observed by Wood that the King greatly affected his company ; but when they happened to talk of a commonwealth, he would scarcely endure it. “ I know not,” says Toland, “ which most to commend : the King for trusting an honest man, though a republican ; or Harrington for owning his principles while he served a King.”

But did his opinions affect his conduct ? Let history again answer : He preserved his fidelity to his unhappy prince to the very last, after all his fawning courtiers had left him to his enraged subjects. He stayed with him while a prisoner in the Isle of Wight ;—came up by stealth to follow the fortunes of his monarch and master ;—even hid himself in the boot of the coach when he was conveyed to Windsor ;—and, ending as he began, fell into his arms and fainted on the scaffold.

After Charles' death the ‘ *Oceana* ’ was written, and as if it were written from justice and affection to his memory ; for it breathes the same noble and spirited regard, and asserts that it was not Charles that brought on the destruction of the Monarchy, but the feeble and ill-constituted nature of monarchy itself.

“ But the book was a flattery to Cromwell ! ” Once more and finally let history decide. The ‘ *Oceana* ’ was seized by the Usurper as a libel, and the way it was recovered is remarkable. I mention it to show that Cromwell was a wise man in himself, and knew on what governments must stand for their support.

Harrington waited on the Protector's daughter to beg for his book, which her father had taken, and, on entering her apartments, snatched up her child and ran away. On her following him with surprise and terror, he turned to her and said : “ I know what you feel as a mother ; feel, then, for me ; your father has got my child,” meaning the ‘ *Oceana*.’ The ‘ *Oceana* ’ was afterwards restored on her petition, Cromwell answering with the sagacity of a sound politician : “ Let him have his book ; if my Government is made to stand, it has nothing to fear from paper shot.” He said true. No good government will ever be battered by paper shot. Montesquieu says : “ In a free nation, it matters not whether individuals reason well or ill ; it is sufficient that they do reason. Truth arises from the collision, and from hence springs liberty, which is a security from the effect of reasoning.” The Attorney-General has read extracts from Mr. Adams's answer to this book. Let others

write answers to it, like Mr. Adams ; I am not insisting upon the infallibility of Mr. Paine's doctrines ; if they are erroneous, let them be answered, and truth will spring from the collision.

Milton wisely says that a disposition in a nation to this species of controversy is no proof of sedition or degeneracy, but quite the reverse (I omitted to cite the passage with the others). In speaking of this subject, he rises into that inexpressibly sublime style of writing, wholly peculiar to himself. He was, indeed, no plagiarist from anything human ; he looked up for light and expression, as he himself wonderfully describes it, by devout prayer to that great Being Who is the source of all utterance and knowledge, and Who sendeth out his seraphim with the hallowed fire of his altar to touch and purify the lips of whom he pleases. " When the cheerfulness of the people," says that mighty poet, " is so sprightly up, as that it hath not only wherewith to guard well its own freedom and safety, but to spare, and to bestow upon the solidest and sublimest points of controversy and new invention, it betokens us not degenerated nor drooping to a fatal decay, but casting off the old and wrinkled skin of corruption, to outlive these pangs and wax young again, entering the glorious ways of truth and prosperous virtue, destined to become great and honourable in these latter ages. Methinks I see in my mind a noble and puissant nation rousing herself, like a strong man after sleep, and shaking her invincible locks ; methinks I see her as an eagle mewing her mighty youth, and kindling her undazzled eyes at the full midday beam ; purging and unscaling her long abused sight at the fountain itself of heavenly radiance ; while the whole noise of timorous and flocking birds, with those also that love the twilight, flutter about, amazed at what she means, and in their envious gabble would prognosticate a year of sects and schisms."

Gentlemen, what Milton only saw in his mighty imagination I see in fact ; what he expected, but which never came to pass, I see now fulfilling ; methinks I see this noble and puissant nation, not degenerated and drooping to a fatal decay, but casting off the wrinkled skin of corruption to put on again the vigour of her youth. And it is because others as well as myself see this, that we have all this uproar. France and its Constitution are the mere pretences. It is, because Britons begin to recollect the inheritance of their own Constitution left them by their ancestors ; it is, because they are awakened to the corruptions which have fallen upon its most valuable parts, that forsooth the nation is in danger of being destroyed by a single pamphlet. I have marked the course of this alarm ; it began with the renovation of those exertions for the public, which the alarmists themselves had originated and deserted ; and they became louder and louder when they saw them

avowed and supported by my admirable friend, Mr. Fox, the most eminently honest and enlightened statesman that history brings us acquainted with—a man whom to name is to honour, but whom in attempting adequately to describe, I must fly to Mr. Burke, my constant refuge when eloquence is necessary—a man who, to relieve the sufferings of the most distant nation, “put to the hazard his ease, his security, his interest, his power, even his darling popularity, for the benefit of a people whom he had never seen.” How much more, then, for the inhabitants of his native country! Yet this is the man who has been censured and disavowed in the manner we have lately seen.

Gentlemen, I have but a few more words to trouble you with: I take my leave of you with declaring that all this freedom which I have been endeavouring to assert is no more than the ancient freedom which belongs to our own inbred Constitution; I have not asked you to acquit Thomas Paine upon any new lights, or upon any principle but that of the law, which you are sworn to administer;—my great object has been to inculcate that wisdom and policy which are the parents of the Government of Great Britain, forbid this jealous eye over her subjects; and that, on the contrary, they cry aloud in the language of the poet, adverted to by Lord Chatham on the memorable subject of America, unfortunately without effect.

“Be to their faults a little blind,
Be to their virtues very kind;
Let all their thoughts be unconfin’d,
Nor clap your padlock on the mind.”

Engage the people by their affections, convince their reason,—and they will be loyal from the only principle that can make loyalty sincere, vigorous, or rational,—a conviction that it is their truest interest, and that their government is for their good. Constraint is the natural parent of resistance, and a pregnant proof that reason is not on the side of those who use it. You must all remember Lucian’s pleasant story; Jupiter and a countryman were talking together, conversing with great freedom and familiarity upon the subject of heaven and earth. The countryman listened with attention and acquiescence, while Jupiter strove only to convince him:—but happening to hint a doubt, Jupiter turned hastily around and threatened him with his thunder. “Ah! ah!” says the countryman, “now, Jupiter, I know that you are wrong; you are always wrong when you appeal to your thunder.”

This is the case with me—I can reason with the people of England but I cannot fight against the thunder of authority.

Gentlemen, this is my defence of free opinions. With regard to myself, I am, and always have been, obedient and affectionate to the law ;—to that rule of action, as long as I exist, I shall ever do as I have done to-day, maintain the dignity of my high profession, and perform, as I understand them, all its important duties.

MICHAEL FARADAY

(1791-1867).

MICHAEL FARADAY, one of the greatest men of science that England has produced, was born in a suburb of London.

From the day-school Michael passed when he was thirteen to be errand-boy to a bookseller. After a year he became an apprentice and began to read some of the books he helped to dust and bind. By grit and sheer ability, and a keen sense of the value of opportunities, he became assistant in 1813 at the Royal Institution to the famous chemist, Sir Humphrey Davy.

He remained at work there, experimenting and lecturing for over fifty years. He might have been a comparatively rich man, for his advice was much sought after by manufacturers and others, but in 1831, when he made one of his great discoveries as to the relationship between electricity and magnetism, he determined to stop all money-making, and on his very modest salary he devoted the rest of his life to the study of Nature's secrets. He had a very wonderful mind, and an exceedingly attractive character. He was always true to his own youthful vision of the philosopher: "The philosopher should be a man willing to listen to every suggestion, but determined to judge for himself. He should not be biassed by appearances, have no favourite hypotheses, be of no school, and in doctrine have no master. He should not be a respecter of persons, but of things. Truth should be his primary object." Faraday died in 1867, one of the most honoured men in Europe.

THE DECOMPOSITION OF WATER

WE have the power of arranging the zinc which you have seen acting upon the water by the assistance of an acid, in such a manner as to cause all the power to be evolved in the place where we require it. I have behind me a voltaic pile, and I am about to show you its character and power. I hold here the extremities of the wires which transport this power from behind me, and which I shall cause to act on the water.

A great power of combustion is possessed by potassium, or zinc, or iron-filings; but none of them show such energy as this. I will make contact between the two terminal wires of the battery: what a brilliant flash of light is produced! This light is, in fact, produced by a forty-zinc power of burning: it is a power that I can carry about in my hands, through these wires, at pleasure—although, if I applied it wrongly to myself, it would destroy me in an instant, for it is a most intense thing, and the power you see here put forth, if I allow the spark to last while you count five, is equivalent to the power of several thunderstorms, so great is its force.

I am now going to apply this force to water to pull it to pieces, to see what else there is in the water besides hydrogen; because if we pass steam through an iron tube, we by no means get the weight of water back which we put in, in the form of steam, though we have a very large quantity of gas evolved. We have now to see what is the other substance present. What effect has an electric current on water? Here are two little platinum-plates which I intend to make the ends of the battery, and this is a little vessel so shaped as to enable me to take it to pieces, and show you its construction. In those two cups I pour mercury, which touches the ends of the wires connected with the platinum-plates. In the vessel I pour some water containing a little acid (but which is put only for the purpose of facilitating the action; it undergoes no change in the process), and connected with the top of the vessel is a bent glass tube which now passes under the jar.

I have now adjusted this apparatus, and we will proceed to affect the water in some way or other. In the other case, I sent the water through a tube which was made red-hot; I am now going to pass the electricity through the contents of this vessel. Perhaps I may boil the water; if I do boil the water, I shall get steam; and you know that steam condenses when it gets cold, and you will therefore see by that whether I do boil the water or not. Perhaps, however, I shall not boil the water, but produce some other effect. You shall have the experiment and see. There is one wire which I will put to this side, and here is the other wire which I will put to the other side, and you will soon see whether any disturbance takes place. Here it is seeming to boil up famously; but does it boil? Let us see whether that which goes out is steam or not, I think you will soon see the jar will be filled with vapour, if that which rises from the water is steam. But can it be steam? Why, certainly not; because there it remains, you see, unchanged. There it is standing over the water, and it cannot therefore be steam, but must be a permanent gas of some sort. What is it? Is it hydrogen? Is it anything else?

Well, we will examine it. If it is hydrogen, it will burn. I will now apply a light to it. You see it is certainly combustible, but not combustible in the way that hydrogen is. Hydrogen would not have given you that noise ; but the colour of that light, when the thing did burn, was like that of hydrogen : it will, however, burn without contact with the air. That is why I have chosen this form of apparatus, for the purpose of pointing out to you what are the particular circumstances of this experiment.

In place of an open vessel I have taken one that is closed ; and I am going to show you that that gas, whatever it may be, can burn without air, and in that respect differs from a candle, which cannot burn without the air. And our manner of doing this is as follows :—I have here a glass vessel which is fitted with two platinum-wires through which I can apply electricity ; and we can put the vessel on the air-pump and exhaust the air, and when we have taken the air out we can fasten it on to this jar, and let into the vessel that gas which was formed by the action of the voltaic battery upon the water, and which we have produced by changing the water into it—for I may go as far as this and say we have really, by that experiment, changed the water into that gas. We have not only altered its condition, but we have changed it really and truly into that gaseous substance, and all the water is there which was decomposed by the experiment. As I screw this vessel on here and make the tubes well connected, and when I open the stopcocks, if you watch the level of the water you will see that the gas will rise. I will now close the stopcocks, as I have drawn up as much as the vessel can hold, and I will pass an electric spark, from an induction coil, through the gas. The vessel was quite clear and bright at first, but it has now become dim with a deposit of water. I will again connect it to our gas reservoir, for that is what the jar really is : and, as I open the stopcocks you see that the water rises : this indicates that the glass vessel must be filling. “ But why is the jar empty after each explosion ? ” you may ask. Because the vapour or gas into which that water has been resolved by the battery explodes under the influence of the spark, and changes into water ; and by-and-by you will see in this upper vessel some drops of water trickling down the sides and collecting at the bottom.

We are here dealing with water entirely, without reference to the atmosphere. The water of the candle had the atmosphere helping to produce it ; but in this way it can be produced independently of the air. Water, therefore, ought to contain that other substance which the candle takes from the air, and which, combining with the hydrogen, produces water.

I will now dip the poles—the metallic ends of this battery—into water, and see what will happen when they are kept far apart. I place one here and the other there, and I have little shelves with holes which I can put upon each pole, and so arrange them that whatever escapes from the two ends of the battery will appear as separate gases ; for you saw that the water did not become vaporous, but gaseous. The wires are now in perfect and proper connection with the vessel containing the water ; and you see the bubbles rising ; let us collect these bubbles and see what they are. Here is a glass cylinder ; I fill it with water and put it over one end of the pile ; and I will take another and put it over the other end of the pile. And so now we have a double apparatus, with both places delivering gas. Both these jars will fill with gas. There they go, that to the right filling very rapidly ; the one to the left filling not so rapidly. I should have twice as much in this as I have in that. Both these gases are colourless ; they stand over the water without condensing ; they are alike in all things—I mean in all apparent things ; and we have an opportunity of examining these bodies and ascertaining what they are. Their bulk is large, and we can easily apply experiments to them. I will take this jar first, and will ask you to be prepared to recognise hydrogen.

Think of all its qualities—the light gas which stood well in inverted vessels, burning with a pale flame at the mouth of the jar—and see whether this gas does not satisfy all these conditions. If it be hydrogen, it will remain here while I hold this jar inverted. It burns when a light is applied to the mouth of the jar ; it is evidently hydrogen.

What is there now in the other jar ? You know that the two together made an explosive mixture. But what can this be which we find as the other constituent in water, and which must therefore be that substance which made the hydrogen burn ? We know that the water we put into the vessel consisted of the two things together. We find one of these in hydrogen : what must that other be which was in the water before the experiment, and which we now have by itself ? I am about to put this lighted splinter of wood into the gas. The gas itself will not burn, but it will rekindle the glowing splinter. See how it invigorates the combustion of the wood, and how it makes it burn far better than the air would make it burn ; and now you see by itself that very other substance which is contained in the water, and which, when the water was formed by the burning of the candle, must have been taken from the atmosphere. What shall we call it, A, B, or C ? Let us call it O—call it “ Oxygen ” : it is a very good distinct-sounding name. This, then, is the oxygen which was present in the water, forming so large a part of it.

We shall now begin to understand more clearly our experiments and researches ; because, when we have examined these things once or twice, we shall soon see why a candle burns in the air. When we have in this way analysed the water—that is to say, separated, or electrolysed its parts out of it—we get two volumes of hydrogen, and one of the body that burns it. And these two are represented to us on the following diagram, with their weights also stated ; and we shall find that the oxygen is a very heavy body by comparison with the hydrogen. It is the other element in water.

Oxygen	...	...	...	88.9
Hydrogen	...	...	...	11.1
<hr/>				
Water	...	...	...	100.0

COMPOSITION OF THE ATMOSPHERE

WE can produce hydrogen and oxygen from the water that we obtained from the candle. Hydrogen, you know, comes from the candle, and oxygen, you believe, comes from the air. But then you have a right to ask me, “ How is it that the air and the oxygen do not equally well burn the candle ? ” If you remember what happened when I put a jar of oxygen over a piece of candle, you recollect there was a very different kind of combustion to that which took place in the air. Now, why is this ? It is a very important question, and one I shall endeavour to make you understand : it relates most intimately to the nature of the atmosphere, and is most important to us.

We have several tests for oxygen besides the mere burning of bodies. You have seen a candle burnt in oxygen, or in the air ; you have seen phosphorus burnt in the air, or in oxygen ; and you have seen iron-filings burnt in oxygen. But we have other tests besides these, and I am about to refer to one or two of them for the purpose of carrying your conviction and your experience further. Here we have a vessel of oxygen. I will show its presence to you : if I take a glowing splinter and put it into that oxygen, you know what will happen ; if I put that spark into the jar, it will tell you whether we have oxygen here or not. Yes ! We have proved it by combustion ; and now here is another test for oxygen, which is a very curious and useful one.

I have here two jars full of gas, with a plate between them to prevent their mixing. One jar is full of oxygen and the other of nitric oxide. I take the plate away, and the gases are creeping one into the other. “ What happens ? ” say you : “ they together produce no such com-

bustion as was seen in the case of the candle." But see how the presence of oxygen is told by its association with this other substance. What a beautifully coloured gas I have obtained in this way, showing me the presence of the oxygen ! In the same way we can try this experiment by mixing common air with this test gas. Here is a jar containing air—such air as the candle would burn in—and here is a jar or bottle containing the test gas. I let them come together, and you see the result : the contents of the test bottle are flowing into the jar of air, and you see I obtain exactly the same kind of action as before, and that shows me that there is oxygen in the air—the very same substance that has been already obtained by us from the water produced by the candle. But then, beyond that, how is it that the candle does not burn in air as well as in oxygen ? We will come to that point at once.

Here are two jars ; they are filled to the same height with gas, and the appearance to the eye is alike in both, and I really do not know at present which of these jars contains oxygen and which contains air, although I know they have previously been filled with these gases. But here is our test gas ; it is being produced in this flask and carried along a delivery tube to the point where it is required. I will arrange our two jars, containing oxygen and air respectively, so that they have their mouths under water. I will dip the tube, delivering the test gas, under each jar in turn. A very curious thing happens. The redness appears but disappears in a few seconds, having dissolved in the water. I may go on in this way, putting in more and more of the test gas, until I come to something left behind which will not redden any longer by the use of that particular body that rendered the air and the oxygen red. Why is that ? It is because there is, besides oxygen, something else present which is left behind. Let us call this gas X until we find out its real name.

Now, you will begin to understand what I am about to say. You saw that when I burnt phosphorus in a jar, as the smoke produced by the phosphorus and the oxygen of the air condensed, it left a good deal of gas unburnt, just as this red gas left something untouched—there was, in fact, this gas left behind, which the phosphorus cannot touch, which the reddening gas cannot touch, and this something is not oxygen, and yet is part of the atmosphere.

So that is one way of opening out air into the two things of which it is composed—oxygen, which burns our candles, our phosphorus, or anything else ; and this other substance—nitrogen—which will not burn them. This other part of the air is by far the larger proportion, and it is a very curious body when we come to examine it ; it is remarkably curious, and yet you say, perhaps, that it is very uninteresting. It is uninteresting in some respects because of this—that it shows no brilliant

effects of combustion. If I test it with a taper as I do oxygen and hydrogen, it does not burn like hydrogen, nor does it make the taper burn like oxygen. Try it in any way I will, it does neither the one thing nor the other ; it will not take fire ; it will not let the taper burn ; it puts out the combustion of everything. There is nothing that will burn in it in common circumstances. It has no smell ; it is not sour ; it does not dissolve in water ; it is neither an acid nor an alkali ; it is as indifferent to all our organs as it is possible for a thing to be. And you might say, " It is nothing ; it is not worth chemical attention ; what does it do in the air ? "

Suppose, in place of having nitrogen, or nitrogen and oxygen, we had pure oxygen as our atmosphere ; what would become of us ? You know very well that a piece of iron lit in a jar of oxygen goes on burning to the end. When you see a fire in an iron grate, imagine where the grate would go to if the whole of the atmosphere were oxygen. The grate would burn up more powerfully than the coals—for the iron of the grate itself is even more combustible than the coals which we burn in it. A fire put into the middle of a locomotive would be a fire in a magazine of fuel, if the atmosphere were oxygen. The nitrogen lowers it down and makes it moderate and useful for us, and then, with all that, it takes away with it the fumes that you have seen produced from the candle, disperses them throughout the whole of the atmosphere, and carries them away to places where they are wanted to perform a great and glorious purpose of good to man, for the sustenance of vegetation ; and thus does a most wonderful work, although you say, on examining it, " Why, it is a perfectly indifferent thing." This nitrogen in its ordinary state is an inactive element ; no action short of the most intense electric force, and then in the most infinitely small degree, can cause the nitrogen to combine directly with the other element of the atmosphere, or with other things round about it ; it is a perfectly indifferent, and therefore, so to say, a safe substance.

But before I take you to that result, I must tell you about the atmosphere itself. I have given below the composition of one hundred parts of atmospheric air :

			BULK	WEIGHT
Oxygen	...	...	20	22.3
Nitrogen	...	...	80	77.7
			—	—
			100	100.0

It is a true analysis of the atmosphere, so far as regards the quantity of oxygen and the quantity of nitrogen present. By our analysis, we find

that 5 pints of the atmosphere contain only 1 pint of oxygen, and 4 pints, or 4 parts, of nitrogen by bulk. That is our analysis of the atmosphere. It requires all that quantity of nitrogen to reduce the oxygen down, so as to be able to supply the candle properly with fuel, so as to supply us with an atmosphere which our lungs can healthily and safely breathe ; for it is just as important to make the oxygen right for us to breathe, as it is to make the atmosphere right for the burning of the fire and the candle.

HERBERT ALBERT LAURENS FISHER

(1865-).

HISTORIAN and educationist was born in London, in 1865 and educated at Winchester and New College, Oxford; completing his studies by terms at Paris and Gottingen. He took a First Class at Oxford and was made Fellow of his College. The next year Mr. Fisher was chosen to deliver the South African Lectures followed by the Lowell Lectures given at Boston the following year.

During 1911-12 Mr. Fisher was Chichele Lecturer in Foreign History; during the next three years he sat on two Royal Commissions. The year 1916 will be remembered as a landmark in English educational history for Mr. Fisher's appointment as Minister of Education marked the coming of the expert. He was Vice-Chancellor of Sheffield University, 1912-16; and became F.R.S., 1920. In 1925 he was elected Warden of New College, Oxford.

EDUCATION AND RECONSTRUCTION

(Delivered in the House of Commons, August 10th, 1917).

THE chief feature in the movement of things is the increased feeling of social solidarity which has been created by the war. When you get conscription, when you get a state of affairs under which the poor are asked to pour out their blood and to be mulcted in the high cost of living for larger international policy, then every just mind begins to realize that the boundaries of citizenship are not determined by wealth, and that the same logic which leads us to desire an extension of the franchise points also to an extension of education. There is a growing sense, not only in England, but through Europe, and, I may say especially in France, that the industrial workers of the country are entitled to be considered primarily as citizens and as fit subjects for any form of education by which they are capable of profiting. I notice also that a new way of thinking about education has sprung up among many of the more neglected members of our industrial army. They do not want education in order that they may become better technical workmen and earn higher wages; they do not want it in order that they may rise out of their own class. They want it because they know that in the treasures of the mind they can find an aid to good citizenship, a source of pure enjoyment, and a refuge from the necessary hardships of a life spent in the midst of the clanging machinery of our hideous cities of toil. I ask whether there is a single struggling young student

in this country to whom a library of good books has not made an elemental democratic appeal?

“ Unlike the hard, the selfish and the proud,
They fly not sullen from the suppliant crowd,
Nor tell to various people various things,
But show to subjects as they show to kings.”

I will now descend to our specific proposals, which may be conveniently though not exhaustively considered under six heads. First, we desire to improve the administrative organization of education. Secondly, we are anxious to secure for every boy and girl in this country an elementary school-life, up to the age of 14 years, which shall be unimpeded by the competing claims of industry. Thirdly, we desire to establish part-time, day continuation schools, which every young person in the country shall be compelled to attend unless he or she is undergoing some suitable form of alternative instruction. Fourthly, we make a series of proposals for the development of the higher forms of elementary education and for the improvement of the physical condition of the children and young persons under instruction. Fifthly, we desire to consolidate the elementary school grants; and sixthly, we wish to make an effective survey of the whole educational provision of the country and to bring private educational institutions into closer and more convenient relation to the national system.

I will first, then, deal with our proposals as affecting the general framework of education. We impose a duty upon the councils of every county and county borough to provide for the progressive development and comprehensive organization of education in their respective areas and to submit schemes to the Board, and in order that this function may adequately be discharged we propose to remove the twopenny limit of the amount to be raised for higher forms of education which was imposed by the Act of 1902. The council of a county or county borough will, in other words, plan out an educational policy. Before submitting its scheme to the Board, the council will be required to consult the authorities having power in the county under Part 3 of the Act of 1902 with reference to the mode in which and the extent to which any such authority will co-operate with the county, and the Board will be informed as to the co-operation to be expected from any such authority. There will, we trust, be little difficulty in securing the degree of co-operation between the authorities within the county areas which may direct it for the presentation of a combined and intelligent plan of educational organization from bottom to top. This, then, is the first point we desire to secure. We impose a duty on each authority to submit an area

scheme, not for elementary education only, but for all forms of education. We impose a duty on the county authorities to consult the Part 3 authority in their area. We impose a duty on the Part 3 authority to co-operate with the Part 2 authority, that is to say, the authority for higher education, to submit a scheme for the performance of its own duties and for co-operation with the Part 2 authority. Finally, we liberate the county authority from the limitation of the twopenny rate.

But there are some educational problems which can be most conveniently considered in relation to an area larger than a county or county borough, and by bodies representing a wider constituency. The supply of elementary teachers, for instance, could be best dealt with in relation to the large areas. So, probably, could a scheme for scholarships to be held at the secondary schools or the universities. Or, again, the provision and utilization of secondary schools might be more scientifically planned out and with less fear of overlapping in the large area than in the small area. It is, of course, possible under the existing law for authorities to combine together for any one or all of such purposes.

It seems to me desirable that distinct statutory authority should be given for the formation of bodies which we may call provincial associations. Assuming that for some purposes it may be convenient to have larger areas than the county or the county borough, one of two ways might be taken to effect this object. The country might be mapped out into eight or nine provincial areas each provided with a council, representing the local education authority of the area together with representatives of the university and other interests and wide powers, including the power to levy a rate, might be assigned to each of these councils. That, I understand, is the scheme advocated by Lord Haldane, who, of course speaks on all educational questions with great authority. Or the Board might be empowered by statute to provide for the establishment of provincial associations after consultation with the authorities concerned, the local education authorities being empowered to delegate administrative and educational functions to these associations, and conversely the associations being empowered to exercise any functions as delegates. The Bill follows the second of these paths. We think it would be premature to carve up England into provincial areas or to embark at once on such a very large scheme of devolution as the advocates of the former plan contemplate. We certainly cannot assume that the local education authorities would be willing to come in to the plan, and we think it wiser to look for our larger authority to a gradual process of coalescence fostered by the State, probably in the first instance with a view to some specific purpose or group of purposes, to which other purposes might in time be added.

We have, then, county and county borough authorities obliged to submit comprehensive schemes of education for their respective areas, and these might be gradually supplemented by provincial associations for the educational purposes which are most conveniently dealt with in relation to areas larger than those of the county and county borough. What do we mean by comprehensive schemes? First, we want to make it plain that the education given in our public elementary schools is not to be considered an end in itself, but as a stage in the child's education destined to lead to other stages. Secondly, we propose to require of local education authorities, under Part 3 of the local Education Act of 1902, to make adequate provision, either by special classes or by means of centre schools, for what may be termed higher elementary education. We desire to meet the objection which is commonly, and not without justice, advanced against so much of the work done in our elementary schools during the last two years, that the children are marking time, that their education is not bringing them on, and that it does not fit them for their future calling. We desire to change all that, and our Bill provides not only for the introduction of practical instruction at appropriate stages, but for the preparation of children for further education in schools other than elementary, and for transference at suitable ages to such schools.

I pass now to a series of proposals which are designed to improve and to strengthen our existing fabric of elementary education so as to secure to every child in the kingdom a sound physique and a solid groundwork of knowledge before the period when the part-time system begins. We propose to encourage the establishment of nursery schools for children under five years, and we empower the local education authorities to raise the age at which normal instruction in the elementary schools begins to six, as soon as there is an adequate supply of nursery schools for the younger children in the area. We propose to amend the law of school attendance so as to abolish all exemptions between the ages of five and fourteen, and we propose to place further restriction upon the employment of children during the elementary school period. The first of these proposals rests upon the belief that children are introduced to the normal instruction of public elementary schools at too tender an age. At four or five years sleep and play are far more important than letters, and we feel that, whenever the home is good, the child should be encouraged to stay with his or her mother. We do not desire to compel the provision of nursery schools, but we propose to enable such schools, attendance at which must be voluntary, to be aided from the rates, and we believe that in the development of these schools, which

will, I trust, often be open-air schools, we may reasonably look for a real improvement in the health of young children.

The second proposal involves as its consequence the abolition of what is known as the half-time system. This is a system which at the present moment mainly flourishes in certain parts of Lancashire and Yorkshire where some 30,000 children between the ages of 12 and 14 are permitted to divide their working day between the factory and the school. Originally the half-time system represented a concession to the claims of education. Boys and girls in Lancashire were released from the factory for a half-day's schooling at a time when in other parts of the country they were still deprived of all educational opportunity. Now the situation is reversed, and the child population in half-time regions suffers under peculiar and exceptional disabilities. The system, of course, has its defenders, just as any system long continued and become a habit, must. The wages earned by the children are acceptable to the parents; the labour supplied by the children is acceptable to the employers; but it is very difficult to see any grounds, apart from the convenience of cheap labour, upon which the continuance of this exceptional system can be defended. It is no argument to plead that the regions in which this system is practised are conspicuously vigorous and intelligent. If any such statement be true, as I believe it to be, it only proves once more how native vigour can triumph over serious obstacles. I do not wish to be understood to be bringing any form of accusation against the employers of half-time labour, many of whom are most considerate to the claims of their workpeople. But the system has been condemned by every educationist and every social reformer. It is bad for the physique of the children, it is injurious to the intellectual prospects of the half-timer, it has been shown that the work upon which the children are engaged is not such as to develop the higher forms of industrial activity, and it has been shown that when the half-time system is once admitted in the textile industry it spreads to other forms of employment as well. Well consider, then, that the time has come when in the general interests of the country and in the special interest of the children notice should be given that this system should, after a convenient interval, come to an end. And I consider that the termination of the war, when a large mass of new labour will be thrown on the market, will be a convenient period at which to terminate it.

The third measure for improving our elementary school education is the further regulation of the employment of children during the period of daily elementary school life. We desire a full period of school life unimpaired by the competing claims of employment, for all children of the working population. At the present moment the effect of our

elementary school education is greatly harmed by the work which is imposed on children out of school hours. They are liable to be employed for three hours before the school opens and for some hours after the school closes, and the general opinion of my inspectors is that of all reforms affecting elementary education there is none more vital than the enforcement of strict limitation of the employment of children in their school-going days. This is not merely a question of scholastic efficiency ; it affects the physical welfare of the race. We have now an overwhelming mass of evidence to the effect that the health of our children suffers from premature or excessive employment. You may trace the evil effects in diminished height and weight, in curvature of the spine, in cardiac affections, and in deficiency of the senses, especially the sense of vision, and in the bad dentition of our working classes. The reports of our school medical service are full of them.

Accordingly, we propose that no child under 12 shall be employed for profit, and here we have already been anticipated by by-laws passed in some of our large municipalities ; and we further provide that no child under 14 shall be employed on any day on which he is required to attend school before the close of school hours or after 8 p.m. on that day, or on other days before 8 a.m., or after 8 p.m. The House will observe that under this provision a child between 12 and 14 may be employed between 6 a.m. and 8 p.m. on Saturdays and during school holidays, and though we have come to the conclusion that there is something to be said for a little employment on days on which the school provides no regular work, we are fully sensible that this liberty may be abused in the future as it has been in the past, and the Bill accordingly provides that the local education authorities, if they are satisfied on the report of the school medical officer or otherwise that the child is being employed in such a way as to be prejudicial to health or education, may forbid or regulate that employment. We have also come to the conclusion that if the local education authority should decide that it would be wise to continue the elementary education in the elementary schools either of the boys or the girls in their area or of boys or girls following particular occupations in that area up to the age of 15 they shall be empowered to do so.

I now come to the most novel, if not the most important, provision in the Bill. We propose that, with certain exceptions to be defined in the Bill, every young person no longer under any obligation to attend a public elementary school shall attend such continuation school as the local education authority of the area in which he resides may require for a period of 320 hours in the year, or the equivalent of eight hours a week for 40 weeks. The main exceptions are the following :—Atten-

dance at schools will not be required in the case of a young person who has received to the satisfaction of the Board suitable full-time instruction up to the age of 16, or has passed the matriculation examination of a university of the United Kingdom or an examination recognized as an equivalent to that, or is shown to be unsuitable or deficient for part-time instruction. In other words, we provide that every young person in the Kingdom who has not received a full-time education up to the age of 16 shall receive a part-time education up to the age of 18, either in schemes provided by the local education authority or in schools under their direction, such as the schools established by manufacturers in their works.

We do not desire to discourage voluntary effort. On the contrary, we believe that very great benefit accrues from the recognition on the part of employers of their educational responsibility towards their employees. We believe that a great many more employers may be induced to start part-time schools connected with their own concerns in view of the general obligations created under this Bill for some form of continued education throughout the period of adolescence. There is another matter of great importance in reference to this proposal: the Bill provides that part-time instruction shall be given by day; it must be taken out of the employers' time, and provision is made to ensure that the young person who is required to attend continuation classes shall not be worked unduly long hours during the days on which the classes are held, and that he or she shall be given a reasonable interval for food, rest, and washing between work and school. The classes, then, are to be held by day, and the pupils are to come to the schools in a fit condition to benefit by the instruction. It is further provided that the classes are not to be held on Sunday or any holiday or half-holiday which a young person is accustomed to enjoy. The proposal comes to this, that any young person who has to undergo full time for instruction will be liberated from industrial toil for three half-days a week during 40 weeks—two half-days to be spent in school, while one will be a half-holiday.

I will now briefly explain how these continuation schools are to be set up and what is the governing idea as to their educational purposes. The Bill devolves upon the local education authorities under Part II. of the Education Act, 1902, either separately or in conjunction with other education authorities, the duty of submitting schemes for a system of continuation schools. The schemes must be submitted before an appointed date, whatever that date may be, and a liberal allowance of time must be granted to the local education authorities appropriate to the special needs of each locality. No doubt the local education authorities will

consult, indeed, under the terms of the Bill they are compelled to consult, industrial and other interests, and it is contemplated that there may be a considerable variety of types of these schools. The schools for the rural populations will no doubt be mainly held in the winter months, for one of the advantages of our local system of administration is that it will enable these new schools to be conducted in accordance with the varying industrial requirements of their situations.

The character of the instruction will be partly physical. We feel that it is important to secure a physical minimum in the schools, and that this is just as important for girls as for boys. We hope to continue the general education on the foundations which have been laid in the public elementary schools, and to give it in addition a vocational bias, the force of which will be graduated according to the age and occupation of the pupils. The details of the courses will, as I have already indicated, vary from locality to locality. The courses given in the rural districts will not be identical with those given in the towns. But the governing plan of the scheme will be identical over the whole country—the production of good citizens, able to make the most of themselves and the environment in which they are placed.

Here I may be asked whether the spell of eight hours a week, or 320 hours a year, is in reality sufficient to accomplish any substantial educational purpose, and why the principle once admitted, a longer period has not been suggested. I need not say that on purely educational grounds I should have preferred a longer amount of instruction, even if that amount had been confined to the age between 14 and 16, but after careful consideration I came to the conclusion, having regard to the practical objections which might be raised that it would be difficult, if not impossible, for us to provide within a reasonable length of time the requisite supply of teachers of ability, that such a scheme, if it is to be made accessible to the working people, would have to be supplemented by a very large expenditure in maintenance allowances, and that it would involve too great a disturbance in the juvenile labour market. At the same time, I should not like it to go abroad that I gave the period of eight hours a week as an ideal. I feel to the full the strength of the contention that young people, whatever may be their situation in life, should primarily be regarded as subjects for education and not as parts of the industrial machine, and it may be that after the lapse of a few years it will become practicable, with the approval of Parliament, to extend the hours for particular classes of schools, or perhaps for the whole scheme of education. The Bill makes provision for such a contingency.

We also believe that many of the continuation schools once brought under this beneficial clause will be more ready to join in the Boy Scouts and Girl Guides, or such wholesome other associations carrying with them intellectual and social advantages. We expressly empower local education authorities to provide school camps and social training with a view to the needs of these classes of students. I confess I am a great believer in the value of school camps for boys between the age of 14 and 16, and I trust that this Bill may pass into law in sufficient time to justify the acquisition by the local education authorities of some of the equipment of camp life which the War Office has so plentifully provided.

Do you mean military camps?

No, Sir, school camps. In asking the employers of this country to assent to these changes—the establishment of day continuation schools, the abolition of half-time, and the further regulation of employment during the period of elementary school life—I feel that I am asking them to submit to a readjustment of the organization of their industries which in some cases will be troublesome to effect. But I rest my appeal upon the broad grounds of national advantage.

We have reached a point in our history when we must take long views. We are a comparatively small country, and we have incurred the hostility of a nation with a larger population, with a greater extent of concentrated territory, and with a more powerful organization of its resources. We cannot flatter ourselves with the comfortable opinion—I wish we could—that after this war the fierce rivalry of Germany will disappear and hostile feeling altogether die down, and this in itself constitutes one reason for giving the youth of our country the best preparation which ingenuity can suggest. There is another reason. We are extending the franchise. We are making a greater demand than ever before on the civic spirit of the ordinary man and woman at a time when the problems of national life and of world policy, as to which this House will be called on to decide, have become exceedingly complex and difficult. How can we expect an intelligent response to the demands which the community propose to make on the constructive judgment of its men and women unless we are prepared to make some further sacrifices in order to form and fashion the mind of the young?

I have the privilege of knowing many manufacturers in this country, and I have never found them reluctant to adopt a course in which their judgment discerned a balance of advantage to the nation. In many lands there is a permanent system of military conscription, and the greater part of the young men of the nation is withdrawn from industrial work for the purely unproductive purpose of military exercises. We are proposing not a form of military conscription, but a form of educational

investment which will involve far less dislocation of industry, far less withdrawal of labour, and will be open to none of those powerful objections to which any system of military conscription is necessarily exposed. And, even if we describe the continued education as a tax on industry, it will be a comparatively small tax. In reality the word "tax" is a misnomer. We cannot describe anything as a tax which has for its necessary effect an addition to the capital on which the tax has been imposed, and it is our opinion that precisely this will be the effect of the continuation classes. What the nation spends with one hand it will get back with the other, and our people will be considerably more intelligent and better disciplined through some measure of educational control continued over the whole period of their adolescence. I would ask the employers of this country who may be tempted to question the wisdom of this measure to reflect how greatly the success of an industry depends on the character of their employees. A factory is like a ship, one bad hand rots the whole company. The employers of this country have a supreme interest in the formation of industrial character, and we believe that the measures which we propose will be calculated, not only to arrest that progress of degradation which is too often apparent after the close of the elementary school period, but to give to the industrial character of our people just that additional measure of stability which it so pre-eminently lacks. The system will be good for boys, but it will be even better for girls.

I have now enumerated the main provisions of the Bill. There are added certain clauses extending the powers and duties of the local education authorities. As I have already explained, the Government is desirous of taking this opportunity of assisting the physical education of the people in every possible way. Physical training is already an element, perhaps not a sufficient element, in our elementary school curriculum, and grants have recently been sanctioned for organizers of physical training in our public elementary schools. The present Bill gives physical training a place in our continuation schools. Every boy and girl in those schools will receive physical training. It goes even further. It empowers the local education authority to establish nursery schools for young children, to maintain playing-fields, school halls, or school game centres, and equipment for physical training, and it extends the powers and duties with regard to medical inspection now possessed by the local education authorities in the case of elementary schools and secondary schools provided by them, and continuation schools under their control. Let us consider what that means to a girl drawn from a slum in one of our great manufacturing towns. She will be under the continual inspection and supervision of the school medical

service. She will have the advantage of physical exercise and remedial training, as well as the practical training which will be part of the work of the continuation schools. I pass to the administrative division.

Is physical training provided for in the continuation schools for boys ?

Certainly.

Among the administrative provisions I would select three for special comment. The first relates to the inspection of schools and other educational institutions not otherwise liable to inspection by Government Departments. Those are public schools and private schools. Many of those schools are notoriously among the best in England, but they depend on private endowments and fees, and are not liable to inspection. We do not propose to compel those schools to submit to inspection by the Board, but we do propose to empower the Board, on request, to inspect such schools free of charge. It is true that we already have this power in the case of a large number of schools falling within the statute. Public schools and many private schools, which obviously reach, or nearly approach, the standard of the Board for secondary schools have been able for the last 10 years to obtain free inspection, and the names of several well-known schools of both classes are to be found on our published list. But a very large number of schools at present do not fulfil this condition, and it is clearly in the interest of the parents and of the community that those schools should have the benefit of such experience and guidance as the Board can put at their disposal. Many of them would be glad of advice and encouragement, but they are just the schools which find it impossible to ask for an inspection to be made.

Does the right honourable gentleman mean a public school like Winchester ? Is it in that sense he is speaking ?

My reference is rather wider. Winchester will certainly come under the description of public schools, but I am using the words " public schools " now in the wide sense of the secondary school not maintained by the Board.

The second point relates to educational information. There is probably no civilized country in Europe in which the Government know so little of what is going on in the field of education as England. The Board has no official knowledge at all of a very large number of schools and educational institutions of an important kind, and very scanty and precarious knowledge of those that are outside the system of grants. I fear that not a few private venture schools are frauds on the public. The teaching is deplorable ; the buildings are inappropriate ; there is no adequate security for the health and progress of the pupils. The Government does not wish to put down private schools. We recognize

that many of them are excellent, and that there is great value in permitting educational experiments of all kinds to be made, even at the cost of some disregard of the normal standard of efficiency. But in view of the large sums of public money invested in education we think that the Board should be in a position to inform itself and Parliament more exactly that it can now do as to the quantity and quality of the total provision of education in the country. Accordingly the Bill provides that, where the necessary information is not otherwise available, the Board may call upon every school or educational institution to furnish particulars.

Thirdly, we provide in the Bill for the consolidation of all grants made for elementary education. It has long been recognized that a block area grant made to the local education authorities in respect of its general education system is more satisfactory than a number of different grants allocated on the basis of particular schools and particular subjects of activity. The introduction of the block grant system will, I hope, conduce to further simplification and the saving of clerical and administrative labour both in Whitehall and in the provinces, though I think it only fair to add that it will undoubtedly involve a heavier burden of responsibility, a more delicate and more enlightened exercise of discretion both in the centre and at the periphery. It is quite obvious that, if you have a general block grant system allocated not for specific purposes, you necessarily imply that there will be considerable intelligence both at the centre and at the circumference. The change is to be recommended not only on the ground of economy. I believe that the moral effect of the proposal which I am pressing upon the House will be all to the good. We want local education authorities to look at the State system of grants broadly, and we desire our own attitude to be equally liberal. We do not want the local education authorities to view every topic from the grant-earning aspect only, to consider whether by doing one thing or another, by developing one subject or another, they may earn a little more or a little less of State grant. We do not wish to be writing letters to the local education authorities arguing that we are paying them 6s. 8d. too much or, it may be, 6s. 8d. too little. On the other hand, if the Minister of Education is to be really responsible to Parliament for the expenditure of the large sums which are voted by Parliament, if Parliament is to have any security that it gets good value for its money, it is of course essential that the central authority should maintain indissoluble and effective powers of administering the grants, so as to give effect to the national policy and equally to protect the nation's interests. Some of the local authorities are better and more to be trusted than others. Subject to this reservation, and broadly

speaking, the more freedom and responsibility we can give the local authorities the better I shall be pleased.

These are some of the general features of the measure which I have the honour on behalf of the Government, of submitting to the House. We assume that education is one of the good things of life, which should be more widely shared than has hitherto been the case amongst the children and young persons of the country. We assume that education should be the education of the whole man, spiritually, intellectually, and physically ; and it is not beyond the resources of civilization to devise a scheme of education, possessing certain common qualities, but admitting at the same time large variation, from which the whole population of the country, male and female, may derive benefit. We assume that the principles upon which well-to-do parents proceed in the education of their families are valid *mutatis mutandis* for the families of the poor, and that the State has need to secure for its juvenile population conditions under which mind, body, and character may be harmoniously developed. We feel also that, in existing circumstances the life of the rising generation can only be protected against the injurious effects of industrial pressure by a further measure of State compulsion. But we argue that the compulsion proposed in this Bill will be no sterilizing restriction of wholesale liberty, but the essential condition of a large and more enlightened freedom. It will tend to stimulate the civic spirit, promote general culture and technical knowledge, and diffuse a steadier judgment and a better-informed opinion through the whole body of the community.

JOHN FLAXMAN

(1755-1826).

THE address on Physical and Intellectual Beauty in man delivered by Flaxman before the English Royal Academy is a model of eloquence,—one of the masterpieces of English oratory and of modern literature. Symonds, in his ‘Studies of the Greek Poets,’ says of Flaxman :—

“ Nature, so prodigal to the English race in men of genius untutored, singular and solitary, has given us but few seers who, in the quality of prolific invention, can be compared with Flaxman. For pure conceptive faculty, controlled by unerring sense of beauty, we have to think of Phidias or Raphael before we can find his equal.”

He expresses in words in such addresses as this the same sense of beauty and of fitness he shows in his illustrations of Homer and in his sculptures. He was born at York, July 6th, 1755—the son of a poor moulder of plaster images. Self-educated, he learned to read Virgil and Homer without a tutor, and entering the Royal Academy at the age of fifteen, he became a professor of Sculpture in it in 1810. His lectures and addresses before it have no equal in their class. The one here given entire is remarkable, not only for its beauty of expression, but for its comprehensive statement of the theory of Evolution afterwards developed by Darwin.

PHYSICAL AND INTELLECTUAL BEAUTY

(Delivered before the President and Members of the Royal Academy).

THAT beauty is not merely an imaginary quality, but a real essence, may be inferred from the harmony of the universe ; and the perfection of its wondrous parts we may understand from all surrounding nature ; and in this course of observation we find that man has more of beauty bestowed on him as he rises higher in creation.

In the contemplation of our solar system, the splendour of the sun and inferior planets, their magnitude, almost incomprehensible to us, their gravitation, the vastness of their revolutions bringing the regular

succession and return of day and night, with the different seasons, all astonish us in their various circumstances ; if we proceed in observation to the starry heavens, crowded with suns, the centres of other systems, we are lost in amazement, and our faculties are overwhelmed.

The objects which surround us on the earth we inhabit are more commensurate to our comprehension and intelligence, and in them we trace wonders equally enforcing by their beauty and order the conviction of power and goodness.

The earth, its history and productions—the sea, its phenomena and contents—the vegetable and mineral kingdoms—have employed, and will continue to employ, the wisest of men in the most delightful speculations and extraordinary discoveries.

The pursuit of each person must be allotted by his station, whilst the industry of each contributes to the circle of knowledge.

Our present object will be, after some general observations on the animal kingdom, to inquire into the excellence of man in his real essence, and its effects on his external appearance—his intelligible alliance with superior natures, or degeneracy and abasement in resemblance to the brutes.

Among the many examples in natural philosophy and history of the gradual and uninterrupted connection of being, from the highest to the lowest, as far as our perceptions will penetrate, the animal kingdom offers most striking and stupendous instances.

There is a resemblance in the organization and bodily form of all animals, which varies by almost imperceptible gradations, through all the links of this chain, from man to the worm or vegetable.

The anatomical form and organization of the orang-outang bears a near resemblance to the anatomy of man ; this configuration continues in squirrels, rats, and mice, until the bat, or flying mouse, unites the race of quadrupeds with birds ; in the same manner the kangaroo and jerboa, with very short fore-legs, and walking on the hind legs only, unite quadrupeds with another class of birds which do not fly,—the penguin, the cassowary, and the ostrich.

The crocodile and alligator unite the race of four-footed beasts with the superior class of reptiles, such as the lizard and the eft, until the frog, being a tadpole in its infant state, belongs to the class of fishes.

The smaller and more imperfect birds approach to the resemblance of the larger butterflies and moths.

The order of flies at length terminates so exactly in the resemblance of a leaf, that it might be taken for one, did not experiment prove, by

the heart, lungs, and anatomical properties, the fly to be perfectly animal, whilst a totally different organization proves the other to be positively vegetable.

Professor Camper, in the most ingenious and valuable notes to his lectures, shows that the figure and organization of man contain the principles on which the structure of all inferior animals is formed, and from which they are removed by gradual imperfections.

Four-footed animals, although their general forms and anatomy bear strong likeness to the human figure, differ from it in these respects : the brain-pan is less ; the nose and jaws have greater projection,—their view is downwards ; the body is supported in a horizontal line by four legs terminated by paws or hoofs ; the interior organization differs in correspondence with the external figure.

The variation of the bird from the beast is that the nose and jaws of one become a beak in the other, the front legs, having lost the paws, are folded up by the sides and are wings.

In fishes the head is set immediately on the body ; they have no legs, their places are supplied by fins, which guide them through the waters.

All these various orders are wonderfully formed in fitness for the elements they inhabit and the purposes of their lives. As their history extends through a large and very interesting portion of creation, so the principles of their conformation and powers comprehend a considerable share of natural science.

The forms of the bones and anatomy contain the geometrical forms, as the motions of the body, limbs, and interior demonstrate the mechanical powers.

The preparation, secretion, and fermentation of the juices are chemical ; hydraulics are in the conveyance and motion of the juices ; pneumatics in the various modes of breathing ; electricity in the effects of heat on the body, and optics in the organs of sight.

Such general observations relate to the bodies of man and other animals ; but we must remember that man, even in the structure of his body, is the most perfect of all creatures ; and the above remarks are only offered to call the attention to the wonderful extent of creation, and the harmony, order, and beauty of its whole connection and disposition.

But in treating of man in particular, our subject is the most perfect production of Almighty power in the visible world, the faculties of whose soul place him far above other creatures, and declare the nearer relation he stands in to his divine Creator.

By the wisdom he is endowed with, all creatures are subjected to his dominion ; by his affections he is enabled to perform all the charities of life—to prefer the interests of others to his own—to distinguish personal beauty as the indication of good disposition and health—to trace his Creator in his works, and offer the homage of his worship ; in all which he is superior to the brute animals, whose exertions are the consequence of instinct for the preservation of themselves and progeny, and whose reasoning has never been discovered to go beyond these purposes, or some particular attachment.

As the affections of man stimulate and engage him in every act, so his understanding directs the means and looks to the end in every employment through life. These modify the exterior of the face and figure, according to constant habit or momentary impulse.

The passionate are known by quick, fiery glances, swollen brows, dilated nostrils, the mouth a little open, the movements of the whole figure sudden, the muscles of the body being disposed to rigidity and contraction.

The melancholy have a general dejection of look, the exterior corners of the eyes and eyebrows tending downwards, a universal slowness of motion and disregard of outward objects.

Every passion, sentiment, virtue, or vice have their corresponding signs in the face, body, and limbs, which are understood by the skilful physician and physiognomist, when not confused by the working of contrary affections or hidden by dissimulation.

In the formation and appearance of the body, we shall always find that its beauty depends on its health, strength, and agility, most convenient motion and harmony of parts in the male and female human figure, according to the purpose for which they were intended ; the man for greater power and exertion, the woman for tenderness and grace. If these characteristics of form are animated by a soul in which benevolence, temperance, fortitude, and the other moral virtues preside, unclouded by vice, we shall recognize in such a one perfect beauty, and remember that “ God created man in his own image.”

We know that sickness destroys the complexion and consumes the form, until that which was once admired for grace and attractive loveliness becomes a ghastly spectre ; and is it not equally evident that brutal ferocity, revenge, hypocrisy, or any other of the malignant passions, still more effectually destroy the very traces of beauty by reducing man to a savage beast in his most degraded state ?

The most perfect human beauty is that most free from deformity, either of body or mind, and may be, therefore, defined :—

“ The most perfect soul in the most perfect body.”

Doubts can scarcely be entertained that there are principles of beauty, because various opinions prevail in different countries on the subject.

Men are in different states of mental and bodily improvement, from the most savage to the most civilized countries, and we know that many successive ages must pass in the confirmation of moral habits, the right direction of reason and elevation of intellect, before man can judge, with any tolerable ability, of mental or natural beauty, their causes, relations, and effects; and that in all states of society, there must be allowance for prejudice and climate. But we shall certainly find that the wisest and the best men in all ages and countries have held nearly the same doctrine on this subject.

The excellence of intellect and moral beauty was asserted by Menu, the Indian legislator; Confucius, the Chinese philosopher; Zoroaster, the Persian sage; and by the Egyptian priests.

Pythagoras, who had studied their wisdom, understood the dispositions of the mind by its influence expressed in the exteriors of the body; and accordingly, Iamblichus, his biographer, tells us he would observe the countenance, figure, looks, movements, manner of speaking and tone of voice, until he was accurately acquainted with any one's character.

Our present purpose particularly requires we should consider the sentiments of the most celebrated Greeks on beauty, the connection of mental and bodily beauty, and their expression in the human form.

Homer constantly endows his gods with personal beauty, accommodated to their mental perfection and immortal power, and his heroes with the attributes of gods; thus, as he gives to Jupiter the epithets of "Counsellor" and "Provident," he describes his hair as "divine," "ambrosial," and his nod as making the world tremble; Juno, he calls the "ox-eyed," and the "white-armed"; Minerva, "the blue-eyed virgin." Achilles, the hero of the 'Iliad,' is the handsomest man that went to Troy; his epithets are "divine," "godlike," "swift-footed"; Agamemnon is called "the king of men"; Nestor and Ulysses are said to be "in council like other gods,"—all expressing the union of mental and bodily excellence.

That the same sentiments continued in aftertimes, we have the coeval testimonies of the most illustrious philosophers, tragedians, orators, and artists.

In Plato's 'Dialogue of Phædrus,' concerning the beautiful, he shows the power and influence of mental beauty on corporeal, and in his dialogue, entitled 'The Greater Hippias,' Socrates observes in argument, "that as a beautiful vase is inferior to a beautiful horse, and as

a beautiful horse is not to be compared to a beautiful virgin, in the same manner, a beautiful virgin is inferior in beauty to the immortal gods ; for," says he, " there is a beauty incorruptible, ever the same." It is remarkable that, immediately after, he says : " Phidias is skilful in beauty."

Aristotle, the scholar of Plato, begins his ' Treatise on Morals ' thus : " Every art, every method and institution, every action and council, seems to seek some good ; therefore, the ancients pronounced the beautiful to be the good."

Much, indeed, might be collected from this philosopher's treatises on morals, poetics, and physiognomy, of the greatest importance to our subject ; but for the present we shall produce only two quotations from Xenophon's ' Memorabilia,' which contain the immediate application of these principles to the arts of design.

In the dialogue between Socrates and the sculptor Clito, Socrates concludes that " Statuary must represent the emotions of the soul by form " ; and in the former part of the same dialogue, Parrhasius and Socrates agree that " the good and evil qualities of the soul may be represented in the figure of man by painting."

In the applications from this dialogue to our subject, we must remember philosophy demonstrates that rationality or intelligence, although connected with animal nature, rises above it, and properly exists in a more exalted state.

From such contemplations and maxims, the ancient artists sublimated the sentiments of their works expressed in the choicest forms of nature ; thus they produced their divinities, heroes, patriots, and philosophers, adhering to the principle of Plato, that " nothing is beautiful which is not good " ; it was this which, in ages of polytheism and idolatry, still continued to enforce a popular impression of divine attributes and perfection.

CHARLES JAMES FOX

(1749-1806).

ACCORDING to the almost universal testimony of his contemporaries, Charles James Fox was one of the greatest intellects of England. If, in the eyes of posterity, judging him out of his own mouth by what his generation pronounced unsurpassed eloquence, he fall below Chatham and Burke, a sufficient explanation is found in habits of life which did not allow his great intellect to take a firm hold on principle—on the fundamental truth of human nature and universal nature, the axioms of justice, liberty, and moral development, without which, as a part of its essence, the greatest mind can never express itself adequately.

Fox joined looseness of morals to brilliancy of intellect. His father taught him libertinism, supplied him with money to indulge in gaming, if not in worse practices, and urged him on, it is said, when, with a young man's modesty, Fox hesitated at lengths which, to the veteran libertine, seemed the commonplaces of aristocratic vice. Unless we can assume that excesses which exhaust the brain can leave unimpaired the intellect of which the brain is the organ, this training is enough to account for whatever is shallow and ineffective in one who might otherwise have been the greatest English statesman of his century.

His father, Henry Fox, afterwards Lord Holland, was inordinately proud of him. Having himself no scruple in following his interest or his pleasure, the elder Fox endeavoured to give his son a training which would make him in everything the peer or the superior of his ancestors, one of whom was no less a person than Charles II. It is said of the elder Mirabeau that he was exasperated to see re-appearing openly in his son those vices he had so carefully concealed in himself. The elder Fox seems to have been pained only by his son's hesitancy in imitating his own example of license. It is not surprising under such training that the son should find the pleasure of losing at cards to be greater than any other except that of winning. In attempting to explain how so much ability in the younger Fox should have survived such a training, it will be worth while to remember that he was educated at Eton, as well as at home. When he returned from the tour of Europe, from gambling at Monaco and from a visit to Voltaire, his father's approval

of him as one of the best-dressed young men of the kingdom did not prevent Doctor Barnard, the celebrated head master at Eton, from having him "horsed" and flogged into some approximation to the Etonian standard of common sense. Thanks to such incidents of his education, Fox, before the close of his public career, could say in a speech in Parliament that he had outgrown the demoralizing habits of his youth.

Born January 24th, 1749, Fox entered Parliament at twenty years of age, as a Tory, and within the next six years was Junior Lord of the Admiralty and of the Treasury under Lord North's administration.

Dismissed in 1774, at the instance of George III., who hated him, Fox went into opposition, and during the remainder of his career acted with the Whigs. In 1782, he was Foreign Secretary under Rockingham, and in 1783 was Foreign Secretary under the Coalition ministry he formed with Lord North. When the Coalition ministry was defeated on the East India Bill, by the direct efforts of the King, Fox remained out of office until 1806, when he served as a member of the Granville cabinet. He died in the same year (September 13th, 1806).

When it is said that he was one of the most eloquent men who ever spoke in the English Parliament, it is meant that when really interested in any subject, he had the faculty of expressing, on the spur of the moment and with all the force possible for him, what most men can express only after long preparation and violent goading of their intellects. That his power of purely extemporaneous expression was phenomenal, there can be no doubt, and if he fall short of the highest possibilities of eloquence, it is only after he has reached the point where there is no further ascent possible, except for those who are forced up by self-sacrificing devotion to principle, by life-long habits of seeking the truth as the compelling cause of action, the always adequate motive of expression. Burke's enemies, in attempting to break the force of his enthusiasm, called him an inspired idiot. Fox's friends might pay him almost every other compliment but that! No doubt, with all his failings, he deserved to be the object of that generosity which prompted Burke in his speech on the East India Bill to say of him:—

"He has faults; but they are faults that, though they may, in a small degree, tarnish the lustre, and sometimes impede the march of his abilities, have nothing in them to extinguish the fire of great virtues. In those faults there is no mixture of deceit, of hypocrisy, of pride, of ferocity, of complexional despotism, or want of feeling for the distresses of mankind."

W.V.B.

ON THE EAST INDIA BILL

(Speech delivered in the House of Commons, December 1st, 1783).

SIR, the necessity of my saying something upon the present occasion is so obvious that no apology will, I hope, be expected from me for troubling the House, even at so late an hour (two o'clock in the morning) I shall not enter much into a detailed or minute defence of the particulars of the bill before you, because few particular objections have been made, the opposition to it consisting only of general reasonings, some of little application, and others totally distinct from the point in question.

This bill has been combated through its past stages upon various principles ; but to this moment the House has not heard it canvassed upon its own intrinsic merits. The debate this night has turned chiefly upon two points—violation of charter, and increase of influence ; and upon both these points I shall say a few words.

The honourable gentleman who opened the debate (Mr. Powys) first demands my attention, not indeed for the wisdom of the observations which fell from him this night (acute and judicious as he is upon most occasions), but from the natural weight of all such characters in this country, the aggregate of whom should, in my opinion always decide upon public measures ; but his ingenuity was never, in my opinion, exerted more ineffectually, upon more mistaken principles, and more inconsistently with the common tenor of his conduct, than in this debate.

The honourable gentleman charges me with abandoning that cause, which, he says in terms of flattery, I had once so successfully asserted. I tell him in reply, that if he were to search the history of my life, he would find that the period of it, in which I struggled most for the real, substantial cause of liberty, is this very moment that I am addressing you. Freedom, according to my conception of it, consists in the safe and sacred possession of a man's property, governed by laws defined and certain ; with many personal privileges, natural, civil and religious, which he cannot surrender without ruin to himself ; and of which to be deprived by any other power is despotism. This bill, instead of subverting, is destined to give stability to these principles ; instead of narrowing the basis of freedom, it tends to enlarge it ; instead of suppressing, its object is to infuse and circulate the spirit of liberty.

What is the most odious species of tyranny ? Precisely that which this bill is meant to annihilate. That a handful of men, free themselves, should execute the most base and abominable despotism over millions of their fellow-creatures ; that innocence should be the victim of oppres-

sion ; that industry should toil for rapine ; that the harmless labourer should sweat, not for his own benefit, but for the luxury and rapacity of tyrannic depredation ; in a word, that thirty millions of men, gifted by Providence with the ordinary endowments of humanity, should groan under a system of despotism unmatched in all the histories of the world.

What is the end of all government ? Certainly the happiness of the governed. Others may hold other opinions, but this is mine, and I proclaim it. What are we to think of a government whose good fortune is supposed to spring from the calamities of its subjects, whose aggrandizement grows out of the miseries of mankind ? This is the kind of government exercised under the East India Company upon the natives of Hindostan ; and the subversion of that infamous government is the main object of the bill in question. But in the progress of accomplishing this end, it is objected that the charter of the company should not be violated ; and upon this point, sir, I shall deliver my opinion without disguise. A charter is a trust to one or more persons for some given benefit. If this trust be abused, if the benefit be not obtained, and its failure arise from palpable guilt, or (what in this case is full as bad) from palpable ignorance or mismanagement, will any man gravely say that that trust should not be resumed and delivered to other hands, more especially in the case of the East India Company, whose manner of executing this trust,—whose laxity and langour have produced, and tend to produce consequences diametrically opposite to the ends of confiding that trust, and of the institution for which it was granted ? I beg of gentlemen to be aware of the lengths to which their arguments upon the intangibility of this charter may be carried. Every syllable virtually impeaches the establishment by which we sit in this House, in the enjoyment of this freedom, and of every other blessing of our Government. These kinds of arguments are batteries against the main pillar of the British Constitution. Some men are consistent with their own private opinions, and discover the inheritance of family maxims, when they question the principles of the Revolution ; but I have no scruple in subscribing to the articles of that creed which produced it. Sovereigns are sacred, and reverence is due to every king ; yet, with all my attachments to the person of a first magistrate, had I lived in the reign of James II., I should most certainly have contributed my efforts, and borne part in those illustrious struggles which vindicated an empire from hereditary servitude, and recorded this valuable doctrine, “ that trust abused is revocable.”

No man, sir, will tell me that a trust to a company of merchants stands upon the solemn and sanctified ground by which a trust is com-

mitted to a monarch ; and I am at a loss to reconcile the conduct of men who approve that resumption of violated trust, which rescued and re-established our unparalleled and admirable Constitution with a thousand valuable improvements and advantages at the Revolution, and who, at this moment, rise up the champions of the East India Company's charter, although the incapacity and incompetency of that company to a due and adequate discharge of the trust deposited in them by that charter are themes of ridicule and contempt to the world ; and although, in consequence of their mismanagement, connivance, and imbecility, combined with the wickedness of their servants, the very name of an Englishman is detested, even to a proverb, through all Asia, and the national character is become degraded and dishonoured. To rescue that name from odium and redeem this character from disgrace are some of the objects of the present bill ; and, gentlemen should, indeed, gravely weigh their opposition to a measure which, with a thousand other points not less valuable aims at the attainment of these objects.

Those who condemn the present bill as a violation of the chartered rights of the East India Company, condemn, on the same ground, I say again, the Revolution as a violation of the chartered rights of King James II. He, with as much reason, might have claimed the property of dominion ; but what was the language of the people ? “ No ; you have no property in dominion ; dominion was vested in you, as it is in every chief magistrate, for the benefit of the community to be governed ; it was a sacred trust delegated by compact ; you have abused that trust ; you have exercised dominion for the purposes of vexation and tyranny—not of comfort, protection, and good order ; and we, therefore, resume the power which was originally ours ; we recur to the first principles of all government—the will of the many, and it is our will that you shall no longer abuse your dominion.” The case is the same with the East India Company's government over a territory, as it has been said by my honourable friend (Mr. Burke), of two hundred and eighty thousand square miles in extent, nearly equal to all Christian Europe, and containing thirty millions of the human race. It matters not whether dominion arise from conquest or from compact. Conquest gives no right to the conqueror to be a tyrant ; and it is no violation of right to abolish the authority which is misused. . . .

SIR RICHARD GREGORY

(1864-).

SIR RICHARD GREGORY was born at Bristol on January 24th, 1864. He is the eldest son of John Gregory. He received his education at Queen Elizabeth's Hospital, Bristol, afterwards joining the Royal College of Science, London. From 1882 to 1885, Richard Gregory filled the first post of his life as Assistant in the Physical Laboratory, Clifton College. He then accepted the appointment of Science Demonstrator in H.M. Dockyard School, Portsmouth.

Eventually Gregory became Computer to the Solar Physics Committee and then Assistant* to Sir Norman Lockyer. At the termination of this office he was appointed Professor of Astronomy of Queen's College, London. For eight years Professor Gregory held the office of Secretary of the Educational Science Section of the British Association. In 1910 he managed to be Vice-President of this Association. Once again he was called upon to fill the honourable post of chairman of the Organizing Committee of the British Scientific Products Exhibitions.

Although a man of many appointments Richard Gregory filled each position with skill and great success. His intellect was conspicuous irrespective of his vocation. The various appointments filled, display his activity of which he possesses a large amount.

Professor Richard Gregory has published many text books of physical geography, physiography and science. From 1893 to 1919, Professor Gregory acted as assistant editor to the scientific journal "Nature," afterwards he became its editor. In addition to his innumerable contributions to this journal, Professor Gregory wrote from time to time for the "Journal of Education" and "Macmillan's Science Monographs," both of which he edited for a few years. Sir Richard Gregory received his knighthood in 1919. Besides being Emeritus Professor of Astronomy, Queen's College, London, he is a fellow of the Royal Astronomical Society and Fellow of the Institute of Journalists.

THE MEANING OF SCIENCE

(Delivered at Edinburgh, 1921).

THE port of science—whether pure or applied—is free, and a modest yawl can find a berth in it as readily as a splendid merchantman, provided that it has a cargo to discharge. Neither the turmoil of war nor the welter of social unrest have prevented explorers of uncharted seas from crossing the bar and bringing their argosies to the quayside, where fruits and seeds, rich ores and precious stones have been piled in profusion for the creation of wealth, the comforts of life, or the purpose of death, according as they are selected and used.

All that these pioneers of science have asked for is for vessels to be chartered to enable them to make voyages of discovery to unknown lands. Many have been private adventurers, and few have shared in the riches they have brought into port. Corporations and Governments are now eager to provide ships which will bring them profitable freights, and to pay bounties to the crews, but this service is dominated by the commercial spirit which expects immediate returns for investments, and mariners who enter it are no longer free to sail in any direction they please or to enter whatever creek attracts them. The purpose is to secure something of direct profit or use, and not that of discovery alone, by which the greatest advances of science have hitherto been achieved.

When science permits itself to be controlled by the spirit of profitable application it becomes merely the galley-slave of short-sighted commerce. Almost all the investigations upon which modern industry has been built would have been put aside at the outset if the standard of immediate practical value had been applied to them. To the man of science discoveries signify extensions of the field of work, and he usually leaves their exploitation to prospectors who follow him. His motives are intellectual advancement, and not the production of something from which financial gain may be secured. For generations he has worked in faith purely for the love of knowledge, and has enriched mankind with the fruits of his labours; but this altruistic attribute is undergoing a change. Scientific workers are beginning to ask what the community owes to them, and what use has been made of the talents entrusted to it. They have created stores of wealth beyond the dreams of avarice, and of power unlimited, and these resources have been used to convert beautiful countrysides into grimy centres of industrialism, and to construct weapons of death of such diabolical character that civilised man ought to hang his head in shame at their use.

Mankind has, indeed, proved itself unworthy of the gifts which science has placed at its disposal, with the result that squalid surroundings and squandered life are the characteristics of modern Western civilisation, instead of social conditions and ethical ideals superior to those of any other epoch. Responsibility for this does not lie with scientific discoveries, but with statesmen and democracy. Like the gifts of God, these of science can be made either a blessing or a curse, to glorify the human race or to destroy it; and upon civilised man himself rests the decision as to the course to follow. With science as an ally, and the citadels of ignorance and self as the objective, he can transform the world, but if he neglects the guidance which knowledge can give, and prefers to be led by the phrases of rhetoricians, this planet will become a place of dust and ashes.

Unsatisfactory social conditions are not a necessary consequence of the advance of science, but of incapacity to use it rightly. Whatever may be said of captains of industry or princes of commerce, scientific men themselves cannot be accused of amassing riches at the expense of labour, or of having neglected to put into force the laws of healthy social life. Power—financial and political—has been in the hands of people who know nothing of science, not even that of man himself, and it is they who should be arraigned at the bar of public justice for their failure to use for the welfare of all the scientific knowledge offered to all. Science should dissociate itself entirely from those who have thus abused its favours, and not permit the public to believe it is the emblem of all that is gross and material and destructive in modern civilisation. There was a time when intelligent working men idealised science; now they mostly regard it with distrust or are unmoved by its aims, believing it to be part of a soul-destroying economic system. The obligation is upon men of science to restore the former feeling by removing their academic robes and entering into social movements as citizens whose motives are above suspicion and whose knowledge is at the service of the community for the promotion of the greatest good. The public mind has yet to understand that science is the pituitary body of the social organism, and without it there can be no healthy growth in modern life, mentally or physically.

This Conference of Delegates provides the most appropriate platform of all those offered by the British Association from which a message of exhortation may be given. There are now 130 Corresponding Societies of the Association, with a total membership of about 52,000, and their representatives should every year go back not only strong with zeal for new knowledge, but also as ministers filled with the sense of duty to inspire others to trust in it. In mechanics work is not considered to be

done until the point of application of the force is moved ; and knowledge, like energy, is of no practical value unless it is dynamic. The scientific society which shuts itself up in a house where a favoured few can contemplate its intellectual riches is no better than a group of misers in its relations to the community around it. The time has come for a crusade which will plant the flag of scientific truth in a bold position in every province of the modern world. If you believe in the cause of disciplined reason you will respond to the call and help to lift civilised man out of the morass in which he is now struggling, and set him on sound ground with his face toward the light.

It is not by discoveries alone, and the records of them in volumes rarely consulted, that science is advanced, but by the diffusion of knowledge and the direction of men's minds and actions through it. In these democratic days no one accepts as a working social ideal Aristotle's view of a small and highly cultivated aristocracy pursuing the arts and sciences in secluded groves and maintained by manual workers excluded from citizenship. Artisans to-day have quite as much leisure as members of professional classes, and science can assist in encouraging the worthy employment of it. This end can be attained by co-operative action between local scientific societies and representative organisations of labour. There should be close association and a common fellowship, and no suggestion of superior philosophers descending from the clouds to dispense gifts to plebeian assemblies. Above all, it should be remembered that a cause must have a soul as well as a body. The function of a mission-hall is different from that of a cinema-house or other place of entertainment, and manifestations of the spirit of science are more uplifting than the most instructive descriptive lectures.

Science needs champions and advocates, in addition to actual makers of new knowledge and exponents of it. There are now more workers in scientific fields than at any other time, yet relatively less is done to create enthusiasm for their labour and regard for its results than was accomplished fifty years ago. Every social or religious movement passes through like stages, from that of fervent belief to formal ritual. In science specialisation is essential for progress, but the price which has to be paid for it is loss of contact with the general body of knowledge. Concentration upon any particular subject tends to make people indifferent to the aims and work of others ; for, while high magnifying powers enable minute details to be discerned, the field of vision is correspondingly narrowed, and the relation of the structure as a whole to pulsating life around it is unperceived.

As successful research is now necessarily limited for the most part to complex ideas and intricate details requiring special knowledge to

comprehend them, very special aptitude is required to present it in such a way as will awaken the interest of people familiar only with the vocabulary of everyday life. In the scientific world the way to distinction is discovery, and not exposition, and rarely are the two faculties combined. Most investigators are so closely absorbed in their researches that they are indifferent as to whether people in general know anything of the results or not. In the strict sense of the word, science can never be popular, and its pure pursuit can never pay, but where one person will exercise his intelligence to understand the description of a new natural fact or principle a thousand are ready to admire the high purpose of a scientific quest and reverence the disinterested service rendered by it to humanity. The record of discovery or description of progress is, therefore, only one function of a local scientific society; beyond this is the duty of using the light of science to reveal the dangers of ignorance in high as well as in low places. Though in most societies there is only a small nucleus of working members, the others are capable of being interested in results achieved, and a few may be so stimulated by them as to become just and worthy knights of science, ready to remove any dragons which stand in the way of human progress, and continually upholding the virtues of their mistress.

When wisdom is justified of her children, and local scientific societies are no longer esoteric circles, but effective groups of enlightened citizens of all classes, they will provide the touchstone by which fact is distinguished from assertion and promise from performance. As the sun draws into our system all substantial bodies which come within its sphere of influence, while the pressure of sunlight drives away the fine dust which would tend to obscure one body from another, so a local scientific society possesses the power of attracting within itself all people of weight in the region around it and of dispersing the mist and fog which commonly prevail in the social atmosphere. Thus may the forces of modern civilisation, moral and material, be brought together, and an allied plan of campaign instituted against the armies of ignorance and sloth. The service is that of truth, the discipline that of scientific investigation, and the unifying aim human well-being. Kingsley long ago expressed the democratic basis upon which this fellowship is founded. 'If,' he said, 'you want a ground of brotherhood with men, not merely in these islands, but in America, on the Continent—in a word, all over the world—such as rank, wealth, fashion, or other artificial arrangements of the world cannot give and cannot take away; if you want to feel yourself as good as any man in theory, because you are as good as any man in practice, except those who are better than you in the same line, which is open to any and every man, if you wish to have the inspiring and en-

nobling feeling of being a brother in a great freemasonry which owns no difference of rank, of creed, or of nationality—the only freemasonry, the only International League which is likely to make mankind (as we all hope they will be some day) one—then become men of science. Join the freemasonry in which Hugh Miller, the poor Cromarty stonemason, in which Michael Faraday, the poor bookbinder's boy, became the companions and friends of the noblest and most learned on earth, looked up to by them not as equals merely, but as teachers and guides, because philosophers and discoverers.'

When Kingsley delivered this message artisans were crowding in thousands to lectures in Manchester and other popular places by leaders in the scientific world of that time. Labour then welcomed science as its ally in the struggle for civil rights and spiritual liberty. That battle has been fought and won, and subjects in bitter dispute fifty years ago now repose in the limbo of forgotten things. There is no longer a conflict between religion and science, and labour can assert its claims in the market-place or council house without fear of repression. Science is likewise free to pursue its own researches and apply its own principles and methods within the realm of observable phenomena, and it does not desire to usurp the functions of faith in sacred dogmas to be perpetually retained and infallibly declared. The Royal Society of London was founded for the extension of natural knowledge in contra-distinction to the supernatural, and it is content to leave priests and philosophers to describe the world beyond the domain of observation and experiment. When, however, phenomena belonging to the natural world are made subjects of supernatural revelation or uncritical inquiry, science has the right to present an attitude of suspicion towards them. Its only interest in mysteries is to discover the natural meaning of them. It does not need messages from the spirit world to acquire a few elementary facts relating to the stellar universe, and it must ask for resistless evidence before observations contrary to all natural law are accepted as scientific truth. If there are circumstances in which matter may be divested of the property of mass, fairies may be photographed, lucky charms may determine physical events, magnetic people disturb compass needles, and so on, by all means let them be investigated, but the burden of proof is upon those who believe in them and every witness will be challenged at the bar of scientific opinion.

We do not want to go back to the days when absolute credulity was inculcated as a virtue, and doubt punished as a crime. It is easy to find in works of uncritical observers of mediæval times most circumstantial accounts of all kinds of astonishing manifestations, but we are not compelled to accept the records as scientifically accurate and to provide

natural explanations of them. We need not doubt the sincerity of the observer even when we decline to accept his testimony as scientific truth. The maxim that "Seeing is believing" may be sound enough doctrine for the majority of people, but it is insufficient as a principle of scientific inquiry. For thousands of years it led men to believe that the earth was the centre of the universe, with the sun and other celestial bodies circling round it, and controlling the destiny of man, yet what seemed obvious was shown by Copernicus to be untrue. This was the beginning of the liberation of human life and intellect from the maze of puerile description and philosophic conception. Careful observation and crucial experiment later took the place of personal assertion and showed that events in Nature are determined by permanent law and are not subject to haphazard changes by supernatural agencies. When this position was gained by science, belief in astrology, necromancy, and sorcery of every kind began to decline, and men learned that they were masters of their own destinies. The late War is responsible for a recrudescence of these mediæval superstitions, but if natural science is true to the principles by which it has advanced it will continue to bring to bear upon them the piercing light by which civilised man was freed from their baleful consequences.

FRANÇOIS PIERRE GUILLAUME GUIZOT

(1787-1874).

FRANÇOIS GUIZOT, the great French historian, statesman, and orator, first developed his remarkable powers of eloquence as a lecturer on history at the Sorbonne. It was there that he delivered the addresses on the Causes of Human Progress, which, published afterwards as a 'History of Civilization,' have done most to immortalize him. They were attended at the time by large audiences whose enthusiastic reception of them was a natural response to their eloquence and a deserved tribute to their intellectual power.

Guizot was born at Nîmes, October 4th, 1787, the son of an advocate who died on the scaffold during the Revolution. Guizot's mother retired with her family to Geneva, where he was educated. In 1805 he went to Paris, intending to devote himself to literature, but he was drawn into politics, which, during the remainder of his life, divided his attention with the work as a historian and educational orator, which more properly belonged to him. His addresses at the Sorbonne were interrupted by his political enemies in 1824, but the Martignac ministry allowed him to resume them. In 1829 he became once more active and prominent in politics, and in 1847 he was the official leader of the cabinet under Louis Philippe, which fell in the Revolution of 1848. He retired to London where his reputation as a historian secured him the greatest respect. In 1850 he was found once more in Paris and once more active in politics, but his political career ended with the *coup d'état*, and the rest of his life was devoted chiefly to increasing his already great usefulness in literature. His 'Life of Washington' won for his portrait a place in the American House of Representatives. His works, all of importance, make a long list in the library catalogues, but it is in the addresses on Civilization at the Sorbonne that his genius reached its climax, and it is on them that his claim for immortality most securely rests. He died September 12th, 1874.

CIVILIZATION AND THE INDIVIDUAL

(From the Lectures on 'Civilization in Modern Europe').

BEING called upon to give a course of lectures, and having considered what subject would be most agreeable and convenient to fill up the short space allowed us from now to the close of the year, it has occurred to me that a general sketch of the history of modern Europe, considered more especially with regard to the progress of civilization,—that a general survey of the history of European civilization, of its origin, its progress, its end, its character, would be the most profitable subject upon which I could engage your attention. . . .

I shall commence this investigation by placing before you a series of hypotheses. I shall describe society in various conditions, and shall then ask if the state in which I so describe it is, in the general opinion of mankind, the state of a people advancing in civilization—if it answer to the signification which mankind generally attaches to this word.

First, imagine a people whose outward circumstances are easy and agreeable : few taxes, few hardships ; justice is fairly administered ; in a word, physical existence, taken altogether, is satisfactorily and happily regulated. But with all this, the moral and intellectual energies of this people are studiously kept in a state of torpor and inertness. It can hardly be called oppression ; its tendency is not of that character—it is rather compression. We are not without examples of this state of society. There have been a great number of little aristocratic republics in which the people have been thus treated, like so many flocks of sheep, carefully tended, physically happy, but without the least intellectual and moral activity. Is this civilization ? Do we recognize here a people in a state of moral and social advancement ?

Let us take another hypothesis. Let us imagine a people whose outward circumstances are less favourable and agreeable ; still, however, supportable. As a set-off, its intellectual and moral cravings have not here been entirely neglected. A certain range has been allowed them—some few pure and elevated sentiments have been here distributed ; religious and moral notions have reached a certain degree of improvement ; but the greatest care has been taken to stifle every principle of liberty. The moral and intellectual wants of this people are provided for in the way that, among some nations, the physical wants have been provided for ; a certain portion of truth is doled out to each, but no one is permitted to help himself—to seek for truth on his own account. Immo-

bility is the character of its moral life ; and to this condition are fallen most of the populations of Asia, in which theocratic government restrains the advance of man : such, for example, is the state of the Hindoos. I again put the same question as before : Is this a people among whom civilization is going on ?

I will change entirely the nature of the hypothesis. Suppose a people among whom there reigns a very large stretch of personal liberty, but among whom also disorder and inequality almost everywhere abound. The weak are oppressed, afflicted, destroyed ; violence is the ruling character of the social condition. Every one knows that such has been the state of Europe. Is this a civilized state ? It may, without doubt, contain germs of civilization which may progressively shoot up ; but the actual state of things which prevails in this society is not, we may rest assured, what the common sense of mankind would call civilization.

I pass on to a fourth and last hypothesis. Every individual here enjoys the widest extent of liberty ; inequality is rare, or, at least, of a very slight character. Every one does as he likes, and scarcely differs in power from his neighbour. But then here scarcely such a thing is known as a general interest ; here exist but few public ideas ; hardly any public feeling ; but little society ; in short, the life and faculties of individuals are put forth and spent in an isolated state, with but little regard to society, and with scarcely a sentiment of its influence. Men here exercise no influence upon one another ; they leave no traces of their existence. Generation after generation pass away, leaving society just as they found it. Such is the condition of the various tribes of savages ; liberty and equality dwell among them, but no touch of civilization.

I could easily multiply these hypotheses, but I presume that I have gone far enough to show what is the popular and natural signification of the word " civilization."

It is evident that none of the States which I have just described will correspond with the common notion of mankind respecting this term. It seems to me that the first idea comprised in the word " civilization " (and this may be gathered from the various examples which I have placed before you) is the notion of progress, of development. It calls up within us the notion of a people advancing, of a people in a course of improvement and melioration.

Now, what is this progress ? What is this development ? In this is the great difficulty. The etymology of the word seems sufficiently obvious—it points at once to the improvement of civil life. The first notion which strikes us in pronouncing it is the progress of society ; the melioration of the social state ; the carrying to higher perfection

the relations between man and man. It awakens within us at once the notion of an increase of national prosperity, of a greater activity and better organization of the social relations. On one hand there is a manifest increase in the power and well-being of society at large ; and on the other a more equitable distribution of this power and this well-being among the individuals of which society is composed.

But the word " civilization " has a more extensive signification than this, which seems to confine it to the mere outward, physical organization of society. Now, if this were all, the human race would be a little better than the inhabitants of an ant-hill or beehive ; a society in which nothing was sought for beyond order and well-being—in which the highest, the sole aim, would be the production of the means of life, and their equitable distribution.

But our nature at once rejects this definition as too narrow. It tells us that man is formed for a higher destiny than this. That this is not the full development of his character—that civilization comprehends something more extensive, something more complex, something superior to the perfection of social relations, of social power and well-being.

That this is so, we have not merely the evidence of our nature, and that derived from the signification which the common sense of mankind has attached to the word, but we have likewise the evidence of facts.

No one, for example, will deny that there are communities in which the social state of man is better—in which the means of life are better supplied, are more rapidly produced, are better distributed, than in others, which yet will be pronounced by the unanimous voice of mankind to be superior in point of civilization.

Take Rome, for example, in the splendid days of the Republic, at the close of the second Punic War ; the moment of her greatest virtues, when she was rapidly advancing to the empire of the world—when her social condition was evidently improving. Take Rome again under Augustus, at the commencement of her decline, when, to say the least, the progressive movement of society halted, when bad principles seemed ready to prevail ; but is there any person who would not say that Rome was more civilized under Augustus than in the days of Fabricius or Cincinnatus ?

Let us look further ; let us look at France in the seventeenth and eighteenth centuries. In a merely social point of view, as respects the quantity and the distribution of well-being among individuals, France, in the seventeenth and eighteenth centuries, was decidedly inferior to several of the other States of Europe ; to Holland and England in particular. Social activity, in these countries, was greater, increased

more rapidly, and distributed its fruits more equitably among individuals. Yet consult the general opinion of mankind, and it will tell you that France in the seventeenth and eighteenth centuries was the most civilized country of Europe. Europe has not hesitated to acknowledge this fact, and evidence of its truth will be found in all the great works of European literature.

It appears evident, then, that all that we understand by this term is not comprised in the simple idea of social well-being and happiness ; and, if we look a little deeper, we discover that, besides the progress and melioration of social life, another development is comprised in our notion of civilization : namely, the development of individual life, the development of the human mind and its faculties—the development of man himself.

It is this development which so strikingly manifested itself in France and Rome at these epochs ; it is this expansion of human intelligence which gave to them so great a degree of superiority in civilization. In these countries the godlike principle which distinguishes man from the brute exhibited itself with peculiar grandeur and power, and compensated in the eyes of the world for the defects of their social system. These communities had still many social conquests to make, but they had already glorified themselves by the intellectual and moral victories they had achieved. Many of the conveniences of life were here wanting ; from a considerable portion of the community were still withheld their natural rights and political privileges ; but see the number of illustrious individuals who lived and earned the applause and approbation of their fellow-men. Here, too, literature, science, and art attained extraordinary perfection, and shone in more splendour than perhaps they had ever done before. Now, wherever this takes place, wherever man sees these glorious idols of his worship displayed in their full lustre,—wherever he sees this fund of rational and refined enjoyment for the godlike part of his nature called into existence, there he recognizes and adores civilization.

Two elements, then, seem to be comprised in the great fact which we call civilization ;—two circumstances are necessary to its existence—it lives upon two conditions—it reveals itself by two symptoms : the progress of society, the progress of individuals ; the melioration of the social system, and the expansion of the mind and faculties of man. Wherever the exterior condition of man becomes enlarged, quickened, and improved ; wherever the intellectual nature of man distinguishes itself by its energy, brilliancy, and its grandeur ; wherever these two signs concur, and they often do so, notwithstanding the gravest imperfections in the social system, there man proclaims and applauds civilization.

Such, if I mistake not, would be the notion mankind in general would form of civilization, from a simple and rational inquiry into the meaning of the term. This view of it is confirmed by history. If we ask of her what has been the character of every great crisis favourable to civilization, if we examine those great events which all acknowledge to have carried it forward, we shall always find one or other of the two elements which I have just described. They have all been epochs of individual or social improvement—events which have either wrought a change in individual man, in his opinions, his manners ; or in his exterior condition, his situation as regards his relations with his fellow-men. Christianity, for example—I allude not merely to the first moment of its appearance, but to the first centuries of its existence—Christianity was in no way addressed to the social condition of man ; it distinctly disclaimed all interference with it.

It commanded the slave to obey his master. It attacked none of the great evils, none of the gross acts of injustice, by which the social system of that day was disfigured ; yet who but will acknowledge that Christianity has been one of the greatest promoters of civilization ? And wherefore ? Because it has changed the interior condition of man, his opinions, his sentiments ; because it has regenerated his moral, his intellectual character.

We have seen a crisis of an opposite nature ; a crisis affecting not the intellectual, but the outward condition of man, which has changed and regenerated society. This also we may rest assured is a decisive crisis of civilization. If we search history through, we shall everywhere find the same result ; we shall meet with no important event, which had a direct influence in the advancement of civilization, which has not exercised it in one of the two ways I have just mentioned. . . .

When any great change takes place in the state of a country,—when any great development of social prosperity is accomplished within it,—any revolution or reform in the powers and privileges of society, this new event naturally has its adversaries. It is necessarily contested and opposed. Now what are the objections which the adversaries of such revolutions bring against them ?

They assert that this progress of the social condition is attended with no advantage ; that it does not improve in a corresponding degree the moral state—the intellectual powers of man ; that it is a false, deceitful progress, which proves detrimental to his moral character, to the true interests of his better nature. On the other hand, this attack is repulsed with much force by the friends of the movement. They maintain that the progress of society necessarily leads to the progress of intelligence and morality ; that, in proportion as the social life is better regulated,

individual life becomes more refined and virtuous. Thus the question rests in abeyance between the opposers and partisans of the change.

But reverse this hypothesis: suppose the moral development in progress. What do the men who labour for it generally hope for? What, at the origin of societies, have the founders of religion, the sages, poets, and philosophers, who have laboured to regulate and refine the manners of mankind, promised themselves? What but the melioration of the social condition; the more equitable distribution of the blessings of life? What, now, let me ask, should be inferred from this dispute and from those hopes and promises? It may, I think, be fairly inferred that it is the spontaneous, intuitive conviction of mankind; that the two elements of civilization—the social and moral development—are intimately connected; that, at the approach of one, man looks for the other. It is to this natural conviction we appeal when, to second or combat either one or the other of the two elements, we deny or attest its union with the other. We know that if men were persuaded that the melioration of the social condition would operate against the expansion of the intellect, they would almost oppose and cry out against the advancement of society. On the other hand, when we speak to mankind of improving society by improving its individual members, we find them willing to believe us, and to adopt the principle. Hence, we may affirm that it is the intuitive belief of man that these two elements of civilization are intimately connected, and that they reciprocally produce one another.

If we now examine the history of the world, we shall have the same result. We shall find that every expansion of human intelligence has proved of advantage to society; and that all the great advances in the social condition have turned to the profit of humanity. One or other of these facts may predominate, may shine forth with greater splendour for a season, and impress upon the movement its own particular character. At times, it may not be till after the lapse of a long interval, after a thousand transformations, a thousand obstacles, that the second shows itself and comes, as it were, to complete the civilization which the first had begun; but when we look closely, we easily recognize the link by which they are connected. The movements of Providence are not restricted to narrow bounds; it is not anxious to deduce to-day the consequence of the premises it laid down yesterday. It may defer this for ages, till the fulness of time shall come. Its logic will not be less conclusive for reasoning slowly. Providence moves through time, as the gods of Homer through space—it makes a step, and ages have rolled away! How long a time, how many circumstances intervened, before the

regeneration of the moral powers of man, by Christianity, exercised its great, its legitimate influence upon his social condition? Yet who can doubt or mistake its power?

If we pass from history to the nature itself of the two facts which constitute civilization, we are infallibly led to the same result. We have all experienced this. If a man make a mental advance, some mental discovery, if he acquire some new idea, or some new faculty, what is the desire that takes possession of him at the very moment he makes it? It is the desire to promulgate his sentiment to the exterior world—to publish and realize his thought. When a man acquires a new truth—when his being in his own eyes has made an advance, has acquired a new gift, immediately there becomes joined to this acquirement the notion of a mission. He feels obliged, impelled, as it were, by a secret interest, to extend, to carry out for himself the change, the melioration which has been accomplished within him. To what but this do we owe the exertions of great reformers? The exertions of those great benefactors of the human race, who have changed the face of the world, after having first been changed themselves, have been stimulated and governed by no other impulse than this.

So much for the change which takes place in the intellectual man. Let us now consider him in a social state. A revolution is made in the condition of society. Rights and property are more equitably distributed among individuals; this is as much as to say, the appearance of the world is purer—is more beautiful. The state of things, both as respects governments, and as respects men in their relations with each other, is improved. And can there be a question whether the sight of this goodly spectacle, whether the melioration of this external condition of man, will have a corresponding influence upon his moral, his individual character,—upon humanity? Such a doubt would belie all that is said of the authority of example and of the power of habit, which is founded upon nothing but the conviction that exterior facts and circumstances, if good, reasonable, well-regulated, are followed, sooner or later, more or less completely, by intellectual results of the same nature, of the same beauty; that a world better governed, better regulated, a world in which justice more fully prevails, renders man himself more just; that the intellectual man, then, is instructed and improved by the superior condition of society, and his social condition, his external well-being, meliorated and refined by increase of intelligence in individuals; that the two elements of civilization are strictly connected; that ages, that obstacles of all kinds, may interpose between them; that it is possible they may undergo a thousand transformations before they meet together; but that sooner or later

this union will take place is certain, for it is a law of their nature that they should do so—the great facts of history bear witness that such is really the case—the instinctive belief of man proclaims the same truth.

FREDERICK HECKER

(1811-1881).

THE German Revolution of 1848 was the greatest event of the nineteenth century for continental Europe. It checked the Reactionists of France, and forced parliamentary government, not only on Germany, but on every other country of continental Europe, except Russia and Turkey. Seeming to end in failure, with its leaders in flight for their lives, it was really one of the great triumphs of the civilized intellect against the mediæval. Its permanent moral success was due to the work of a few dauntless young Germans, scholars and thinkers, with Frederick Hecker as one of the most dauntless among them. He was born at Eichtersheim in Baden, September 28th, 1811. After graduating in law at Heidelberg, he began practising his profession in the supreme court at Manheim. His great eloquence led to his election to the second chamber in Baden, and his liberal sympathies soon brought him into close relations with the opponents of German absolutism—notably with the Turner societies, in which opposition to despotic government had taken a strong hold. After the failure of the revolution of 1848 and the defeat at Kandern (April 20th, 1848), he escaped to Basel where for some time he edited a progressive newspaper. Finding the Reactionists too strong for him, he joined the thousands of young German Liberals who were emigrating to the United States. Settling in Illinois, not far from St. Louis, he passed the remainder of his useful life in America, serving as a Colonel in the Civil War and dying in 1881. His speeches and lectures, which are published in German by C. Witter, of St. Louis, are examples of most extraordinary eloquence. When they are better known in Germany,—as they are likely to be before the close of the twentieth century,—they will go far to establish Colonel Hecker's reputation as one of the most eloquent men who ever spoke the German language.

LIBERTY IN THE NEW ATLANTIS

(An Oration delivered on July 4th, 1871, at Trenton, U.S.A.).

THE roar of war in the Old World has died away ; the shout of victory grows less noisy ; graves sink in, blood-pools are washed away, and hard by the ruins of palaces and hovels sit Misery and Heartache and Want, while we hallow the birthday of this great free

nation, celebrate the independence of this Atlantis from the power of princes and the yoke of kings, and consecrate this banner, the symbol of the courage of manhood and the love of liberty !

Independence ! a grand word, whose full enjoyment none of woman born can share. And he can hold himself most fortunate, when the greatest measure of dependency has been lifted from his shoulders !

Independence and Liberty are an inseparable pair of sisters. Only he who is independent is free, and the freeman alone is independent !

And this is the higher purpose of genuine Turn-craft—to develop the body and to deliver it from weakness and ailments ; to free the intellect from all shackles ; with “ the wing-stroke of free mind to disperse the spectres of ignorance, of superstition, of irrestraint, and the spirit of servility ! With uplifted banner, with body and with mind to strive towards independence and liberty ! ” As in the ever-memorable era of 1848-49, the Turners, rank on rank, clear in their might of manhood, stood first in freedom’s camp, so here, likewise, they were among the first who battled against oligarchy ; who with their bodies defended the unity, the equality, the liberty, the union of this land ; who bled for them and joyously marched to their death for them. And as the Turners have ever held it a duty to fight in the front rank for manhood rights and human freedom, so they will fall back from their place and from their flag, emblem of their principles, only when they are carried back—dead !

The Republican form of government is the arch of triumph that leads to the realization of our high ideal ! The Republic, because it has for its foundation liberty and equality,—because it gives the individual man time and room for free, untrammelled development,—is the highway that leads to the temple of true human dignity. And on this holiday, it becomes us to glance around us and to look upon the picture which the Age unrolls before us !

Two nations celebrate their independence this year. We celebrate here our independence from king-craft, from our parent stock beyond the waters, and from oppression which other nationalities exercised over their spontaneity, their individuality, their power, their development !

Germany is no longer obliged now to receive as tantamount to orders the wishes of a Czar and his Nesselrode, or to put up with the culture and civilization dictated by a ruler of Pandours, Croats, Slovaks, and the like, with his Metternich ! No longer has she to submit to the trade ordinances of the oligarchical monarchic shopkeepers of Great

Britain, with her Castlereaghs, Wellingtons, and Russells! No longer has she to be on the watch for the crowing of the Gallic cock, for the prey scream of the eagle, or the fanfaronades of Gaul!

Germany has seized and holds her future in her own strong hand. And as she fought for her national independence against the outside, so on the inside may she conquer independence for the individual citizen, celebrating solemnly, as we do each year, the day of a Magna Charta, and not merely a peace sealed with the pommel of the sword. Treaties of peace are short of breath and short lived! Free constitutions endure from generation to generation!

On the day on which ninety-five years ago the American people declared their independence and in doing so announced and spread before the whole world the gospel of the people—from that ever-memorable day on, the wages of the trade of royalty steadily fell! Yes, Kingship got to be, as to-day in Spain, knocked down to the lowest bidder, and this great Continent, which almost reaches from pole to pole—this Atlantis, with legends of which Egyptian priests had filled the minds of Solon and of Plato—this our sea-born Atlantis is destined to rejuvenate the world into Liberty! And on the birthday of the American Republic it becomes us well to consider the effect of that solemn act of the Declaration of Independence and to draw comparisons of the conditions of the other nations.

At that time this country had a population of two million eight hundred thousand inhabitants. This immense territory was a wilderness, a home for wild beasts and wilder savages. To-day the people number close to forty millions, and before the St. Sylvester night of 1899, when the nineteenth century is rung out and the twentieth is rung in, there will be from eighty million to one hundred million Republicans here to celebrate the day! A shiver creeps along the backbone of Kingcraft and its servitors at the thought!

A hundred millions of Republicans—a fearful propaganda! “O my exalted, imperial master! What is to become of us!” stutter the lackeys. With a shrill scream, like a new Phoenix, arisen from brass-slack and ashes, rushes the locomotive through what lately was wilderness, away over hill and abyss, dale and waters, chasm and plain, from the Atlantic to the Pacific. It is bannered with the Stars and Stripes, and the piercing sound that echoes from its waving folds strikes my ear: “Free, free, free!” On all the seas floats this respect-compelling symbol of free citizenship! On stream and ocean, on a thousand highways, by land-roads, sea-roads, and railroads, there is a rush and activity like that of ants or honeybees; and further, ever further, the country opens its lap and shakes therefrom the riches of the earth!

Here only those beg who will beg. And this country is not directed by kings and high-born gentlemen ; not protected by mighty standing armies, not governed by a well-clothed and trained body of officials. It is not governed from " on High ! " Possibly it is not governed at all ! It dispenses with the entire happiness-bestowing paraphernalia of European nations, and still it grows, extends itself, and prospers. In amazement the nations view the resurrected Atlantis and ask : Who has done all this ? Who is the necromancer ?

It is the Liberty, it is the Independence, which deprives no human being of his opportunity for development and activity.

With a contemptuous shrug of the shoulders, the children of antiquated, over-refined and, almost stereotyped culture may gaze on the man from the great Western Continent, and on his rough, often unpolished manners, and point their fingers to outbursts of uncouthness and unrestraint here and there. Where man dwells, there dwell also men's passions. The difference between here and there is only in this. Here passion rages publicly, seen by the world's eyes. There a veil is spread over the corruption of society. The common people of New York, even when not regarded as a present from the Old World, are not worse, are not more abominable, than the populace of Europe's great centres of humanity. For all that and all this, " we sovereign members of a sovereign people " prefer to move and have our being here under the Stars and Stripes rather than under any tricolor of royal might and splendour of monarchical ordination and subordination.

No doubt there are some few, who, having scraped a sufficiency of mammon together, have returned to the Old World, and there have scattered broadcast their condemnation of this country and its people, telling how differently they feel among polished gentlemen, beautiful women, and the fine lace ruffles of the court under the protection of Imperial Majesty and the royal police. But be it said as a subject for your consolation, my friends, that those, who, to the great joy of every European beadle and beggar-catcher and of his lord and master, thus cast their potsherd ballot of condemnation, of ostracism against the Republic, consist only of three kinds :—

Either they are of the kind who stand in admiration before their own greatness and distinction ; who recoil before our West, because kid gloves are still so scarce and our unrestrained manners are still so unsmooth and roughly weltd ; who, in fine, have stuck in the seacoast cities of the East, because there it is a little more like Europe, but principally because there it is easier to pile up money ! Their greatness was not a source of wonder ! They felt themselves banished, turned back ! They took a short look at the Union through New York Paddy, Tammany

spectacles, and crawfished back to their mothers! Or, they are those over whom the shell of European customs, *convenience*, and social formations had grown as tightly as if they were crabs, and consequently they had it always in mind to return—as soon as they had made friends with the Almighty Dollar. The third on this and on the other side of the ocean consists of disappointed ne'er-do-wells, enthused by the hope of the greatest possible amount of enjoyment and, if possible, of no work at all. Members of the first two classes take pains, however, to invest the savings they have scraped together in American securities. For that object, the Republic is good enough for them.

We will not be broken-hearted, seeing them go back whence they came. They may feel happier among house servants and court lackeys than in our company, and may hurrah in front of the statue of Frederick Wilhelm III., which significantly was unveiled on the day on which the people in arms celebrated the victory they had won,—the statue of that Frederick Wilhelm III., who persecuted Turnerism, who organized the “ crusade against demagogues,” who with press, speech, associations, meetings, and other gags and clubs, declared war on every liberal idea, and at whose death the entire German nation breathed freer as if it were released from a nightmare.

One thing more we will shout at those tired of America. “ You have taken your seat between two stools! Those abroad regard you suspiciously as not belonging to their class, while we over here will have nothing to do with you! March! Off with you!”

That this nation has steadily grown in power, has exhibited its assets to all the people of the universe; that notwithstanding many shortcomings in administration and policy, which alas! are inseparable from human nature, it has steadily prospered; that of all the countries of the world, except England, it is the only one which has decreased its national debt, while others have suffered deficit after deficit, asked for loan after loan, accumulating a truly wonderful garland of I.O.U.'s—what a spectacle that contrast makes for those beyond the Atlantic Ocean!

A cry of horror and indignation is set up on account of cruelties, bloodshed, murder, and incendiarism perpetrated by dehumanized, hell-crazed people in Paris! It is a shriek against the incarnate red spectre, still as of old a threatening of all existing things, all order, the entire social fabric of the present!

“ This,” they say, “ is the result of your teachings of the freedom and the equality of man, of human dignity and of human rights!” “ There you are with your Republic!” howls the whole horde of reaction. The court chamberlains are hanging on all the fire-alarm bells; the

lackeys high and low are ringing the tocsin against freedom, and training on royal tricolor poles their *lettres de cachet* against the Republic and Republicanism throughout the world, from Petersburg to Madrid. What a vulture feast they are preparing as they get ready to rend the flesh of the Prometheus of Liberty!

Who, I ask of you, ye rulers and quaking knaves,—who is it that forced the growth of all these horrors and hideous crimes, of all this scoundrelism and debauchery? Was it not thou, Ape of Octavianus, who with word and letter played the Socialist? Then these rascals and swindlers, these Mires, Mornies, Pereires, and Maganys, these Jeckers and St. Arnands,—the entire circumcised and uncircumcised lot,—who was it cultivated, preferred, distinguished, selected, and raised them to the dignities of representatives of Cæsarism? Was it not you who fostered rivalry and extravagance, parade, and fashion, and folly, hiding under high-sounding names whatever was worse and most corrupt, as we know from Plutarch and Tacitus was once done by your likes in the decadence of Athens and Rome? Harlots became “demi-monde”; swindles passed as “institutes of credit”; murder and deportation were called “the salvation of order”; vice was courtier like, and for all this they are praised as the “saviours of society”—these hangmen of reaction!

Did not the great ones of earth become his guests and bend the hinges of their knees before the doubtful reputation of his wife? Did they not recline upon his pillows, and banquet and gorge themselves? And at the World Exposition, and there where the grey monuments of the despotic Pharaohs cast their gaze towards the Suez Canal—there stood the neglected, hard-working, hungry people where they could see the Cocotte, the Cancan covered with gold and diamonds, and official thieves in brilliant equipages and embroidered uniforms! They saw the feast of Belshazzar and the lustful splendour of the woman of the Apocalypse.

“Am I not better than Cora Pearl, the Boulanger, the Schneider? Mine and my mother’s past are not Montijo’s,” said the pale wife of the proletarian. “Do I not earn my scanty bread in the sweat of my brow?” grumbled the workman in his house, as the protected gamblers of the Stock Exchange and the grand larcenists of wealth in their well-fed splendour drove in a whirl past them.

When you have cut the foundation of morals from under the feet of the people, you accuse liberty and human rights of the crime, ye true sons of Lucifer! But believe not, my friends, that these conditions are alone centred in Paris and France.

The cancer of the age does its foul work in all the great hells of humanity—in London and Vienna, in Petersburg and Berlin, in Rome

and Madrid, in every place where are collected those who for easy gain, higher enjoyment, and greater wealth await opportunities for anything, no matter what ; or, fearing the light, are obliged to hide in the labyrinth of the seas of houses, where myriad funguses moulder before one plant takes healthy root ; where the sediment and ferment of misery-stricken human nature seek to leave their deposit !

It is the cancer of a richly inventive, exaggerated, indispensable industrialism which devours small industries as Saturn did his children. It is an age which has produced ephemeral millionaires, and millions of envious working men filled with the darts of hate. Nineveh and Babylon, Sodom and Gomorrah, Antioch and Byzantium ? Who is it that will dissolve this strange enchantment, and read this riddle of the Sphinx ?

But the more a legion of officials and soldiers, of nobles and princes, representing unproductive activity, call upon the productive activity of the people to uphold the old society and its forms, the faster the maintenance of that order will undermine order itself.

The ship drives into the rapids ! Faster and faster ! Downwards, downwards ! into the foaming waters ! into the chasm's abyss !

As yet, danger to this country is not near, where the greater part of the land is still waiting for millions and millions of hands to bring its treasure to light. But already inherited cancerous ulcers of corruption—money-monarchies and bandit-associations of powerful monopolies make themselves felt among our public servants !

But into our hands, into our sovereign hands, has it been given to use the surgeon's knife and the cauterizing iron. At the hour when the people will it, will these faithless thieves be scourged at the pillory, these monopolies annihilated, these plunder-bands be dispersed ! The whole people, the State, will step into the place of the monopolists ! Already our new Constitution in Illinois has taken the first step, and we make acknowledgment to the most irreproachable of the governors of Illinois, J. M. Palmer, for his intervention.

In conclusion, let me call up before you a vision, a dream. Heavy night lay over the earth and sky ; the sea was dark, filled with high, black waves, and a proud woman in golden armour, the standard of the Republic undulating in her hand, led me up to a high sea-beaten cliff, that in the ocean afar overtopped the hills of earth ! When she raised her hand towards the East, a thousand lights from the Aurora Borealis blazed forth ; and like a fire-lit picture before me the Old World lay ! In trumpet tones sounded a mighty voice : I am the destiny of the Old World, I am America, and I will plant the banner of the deliverance of humanity on every land ! See, I have taken away hunger from the

lands of the East ! I have given them the potato and the golden ear of maize ! I have healed their fever-shaken bodies with the bark of the cinchona ; with balm of healing herbs I have restored their bodies, and with the aroma of tobacco I have beguiled their cares. With woods for dyes, for use, for ornament, I have adorned their houses and completed and furnished their ships. The steamer, the tamed leviathan and the lightning's writing are my work, and from seashore to seashore my sons have laid iron strands until they have encircled the globe. Against my shores the Gulf Stream breaks its force and hastens on to warm the farthest northland of Europe. In the Florida gulf invisibly and silently the coral billions are at work to turn the Gulf Stream and to cover Europe with ice, but my genius will remove this barrier. The iron-cuirassed ship and the ram of bronze and the monitor are the children of my brain ; and I have taught the laws of the Trade Winds, and I pour out the treasures of the depths of the sea and the land for my people, that it may be multiplied and nourished, while to protect it I hold over it and its future this bright banner of the Stars and Stripes,—an emblem of freedom and human dignity for all,—that beneath it shall be a rendezvous for the free of the earth. And in this sign, I will conquer.

HERMANN FERDINAND HELMHOLTZ

(1821-1894).

THE scientific imagination was never so daring as in the nineteenth century, nor was its daring ever more strikingly illustrated than in the theory of the correlation of forces and the conservation of energy, so eloquently presented by Helmholtz in his Heidelberg address of 1871. The sublimity of its peroration has hardly been surpassed. His comparison of the vital principle to flame, and to a musical chord which is no sooner struck than it becomes an entity other than and above the material agency producing it, would hardly have been possible for any one but a man of science, representing the highest scientific and æsthetic culture of his century.

He was born at Potsdam, August 31st, 1821, and in 1843 began his professional career as military physician in that city. From 1849 when he became Professor of Physiology at Königsberg until his death, September 8th, 1894, he increased in intellectual power and in reputation. He held professorships at Bonn, Heidelberg, and Berlin, invented the ophthalmoscope, wrote 'The Theory of the Conservation of Force,' 'The Doctrine of Tone-Generation,' and other era-making works, and made discoveries in acoustics and optics which attracted the attention of the scientific world. No one who reads 'The Mystery of Creation,' here given from his Heidelberg addresses of 1871, will need to be told that he had an intellect of the highest order.

THE MYSTERY OF CREATION

(An Address delivered at Heidelberg in 1871).

ALL life and all motion on our earth is, with few exceptions, kept up by a single force, that of the sun's rays, which bring to us light and heat. They warm the air of the hot zones; this becomes lighter and ascends, while the colder air flows from the poles. Thus is formed the great circulation of the passage-winds. Local differences of temperature over land and sea, plains and mountains, disturb the uniformity of this great motion, and produce for us the capricious change of winds. Warm aqueous vapours ascend with the warm air,

become condensed into clouds, and fall in the cooler zones, and upon the snowy tops of the mountains, as rain and as snow. The water collects in brooks, in rivers, moistens the plains, and makes life possible ; crumbles the stones, carries their fragments along, and thus works at the geological transformation of the earth's surface. It is only under the influence of the sun's rays that the variegated covering of plants of the earth grows ; and while they grow, they accumulate in their structure organic matter, which partly serves the whole animal kingdom as food, and serves man more particularly as fuel. Coals and lignites, the sources of power of our steam engines, are remains of primitive plants, the ancient production of the sun's rays.

Need we wonder if, to our forefathers of the Aryan race in India and Persia, the sun appeared as the fittest symbol of the Deity ? They were right in regarding it as the giver of all life—as the ultimate source of almost all that has happened on earth.

But whence does the sun acquire this force ? It radiates forth a more intense light than can be attained with any terrestrial means. It yields as much heat as if fifteen hundred pounds of coal were burned every hour upon each square foot of its surface. Of the heat which thus issues from it, the small fraction which enters our atmosphere furnishes a great mechanical force. Every steam engine teaches us that heat can produce such force. The sun, in fact, drives on earth a kind of steam engine whose performances are far greater than those of artificially constructed machines. The circulation of water in the atmosphere raises, as has been said, the water evaporated from the warm tropical seas to the mountain heights ; it is, as it were, a water-raising engine of the most magnificent kind, with whose power no artificial machine can be even distantly compared. I have previously explained the mechanical equivalent of heat. Calculated by that standard, the work which the sun produces by its radiation is equal to the constant exertion of seven thousand horse power for each square foot of the sun's surface.

For a long time experience had impressed on our mechanicians that a working force cannot be produced from nothing ; that it can only be taken from the stores which nature possesses, which are strictly limited, and which cannot be increased at pleasure—whether it be taken from the rushing water or from the wind ; whether from the layers of coal, or from men and from animals, which cannot work without the consumption of food. Modern physics have attempted to prove the universality of this experience, to show that it applies to the great whole of all natural processes, and is independent of the special interests of man. These have been generalized and comprehended in the all-ruling natural law of the conservation of force. No natural process, and no series of natural

processes, can be found, however manifold may be the changes which take place among them, by which a motive force can be continuously produced, without a corresponding consumption. Just as the human race finds on earth but a limited supply of motive forces, capable of producing work, which it can utilize but not increase, so also must this be the case in the great whole of nature. The universe has its definite store of force, which works in it under ever-varying forms ; is indestructible not to be increased, everlasting and unchangeable like matter itself. It seems as if Goethe has an idea of this when he makes the earth-spirit speak of himself as the representative of natural force :—

“ In the currents of life, in the tempests of motion,
In the fervour of art, in the fire, in the storm,
Hither and thither,
Over and under,
Wend I and wander.
Birth and the grave,
Limitless ocean,
Where the restless wave
Undulates ever
Under and over,
Their seething strife
Heaving and weaving
The changes of life.
At the whirling loom of time unawed,
I work the living mantle of God.”

Let us return to the special question which concerns us here : Whence does the sun derive this enormous store of force which it sends out ?

On earth the processes of combustion are the most abundant source of heat. Does the sun's heat originate in a process of this kind ? To this question we can reply with a complete and decided negative, for we now know that the sun contains the terrestrial elements with which we are acquainted. Let us select from among them the two, which, for the smallest mass, produce the greatest amount of heat when they combine ; let us assume that the sun consists of hydrogen and oxygen, mixed in the proportion in which they would unite to form water. The mass of the sun is known, and also the quantity of heat produced by the union of known weights of oxygen and hydrogen. Calculation shows that under the above supposition the heat resulting from their combustion would be sufficient to keep up the radiation of heat from the sun for three thousand and twenty-one years. That, it is true, is a long time, but even

profane history teaches that the sun has lighted and warmed us for three thousand years, and geology puts it beyond doubt that this period must be extended to millions of years.

Known chemical forces are thus so completely inadequate, even on the most favourable assumption, to explain the production of heat which takes place in the sun, that we must quite drop this hypothesis.

We must seek for forces of far greater magnitude, and these we can only find in cosmical attraction. We have already seen that the comparatively small masses of shooting stars and meteorites can produce extraordinary large amounts of heat when their cosmical velocities are arrested by our atmosphere. Now, the force which has produced these great velocities is gravitation. We know of this force as one acting on the surface of our planet when it appears as terrestrial gravity. We know that a weight raised from the earth can drive our clocks, and that in like manner the gravity of the water rushing down from the mountains works our mills.

If a weight fall from a height and strike the ground, its mass loses, indeed, the visible motion which it had as a whole—in fact, however, this motion is not lost; it is transferred to the smallest elementary particles of the mass, and this invisible vibration of the molecules is the motion of heat. Visible motion is transformed by impact into the motion of heat.

That which holds in this respect for gravity holds also for gravitation. A heavy mass, of whatever kind, which is suspended in space separated from another heavy mass, represents a force capable of work. For both masses attract each other, and, if unrestrained by centrifugal force, they move toward each other under the influence of this attraction; this takes place with ever-increasing velocity; and if this velocity is finally destroyed, whether this be suddenly by collision, or gradually by the friction of movable parts, it develops the corresponding quantity of the motion of heat, the amount of which can be calculated from the equivalence previously established, between heat and mechanical work.

Now we may assume with great probability that very many more meteors fall upon the sun than upon the earth, and with greater velocity, too, and therefore give more heat. Yet the hypothesis that the entire amount of the sun's heat which is continually lost by radiation is made up by the fall of meteors, a hypothesis which was propounded by Mayer, and has been favourably adopted by several other physicists, is open, according to Sir W. Thomson's investigations, to objection; for, assuming it to hold, the mass of the sun should increase so rapidly that the consequences would have shown themselves in the accelerated motions of

the planets. The entire loss of heat from the sun cannot at all events be produced in this way ; at the most a portion, which, however, may not be inconsiderable.

If, now, there is no present manifestation of force sufficient to cover the expenditure of the sun's heat, the sun must originally have had a store of heat which it gradually gives out. But whence this store ? We know that the cosmical forces alone could have produced it. And here the hypothesis, previously discussed as to the origin of the sun, comes to our aid. If the mass of the sun had been once diffused in cosmical space, and had then been condensed,—that is, had fallen together under the influence of celestial gravity,—if then the resultant motion had been destroyed by friction and impact with the production of heat, the new world produced by such condensation must have acquired a store of heat, not only of considerable, but even of colossal magnitude.

Calculation shows that, assuming the thermal capacity of the sun to be the same as that of water, the temperature might be raised to twenty-eight million of degrees, if this quantity of heat could ever have been present in the sun at one time. This cannot be assumed, for such an increase of temperature would offer the greatest hindrance to condensation. It is probable rather that a great part of this heat which was produced by condensation began to radiate into space before this condensation was complete. But the heat which the sun could have previously developed by its condensation would have been sufficient to cover its present expenditure for not less than twenty-two million years of the past.

And the sun is by no means so dense as it may become. Spectrum analysis demonstrates the presence of large masses of iron and of other known constituents of the rocks. The pressure which endeavours to condense the interior is about eight hundred times as great as that in the centre of the earth ; and yet the density of the sun, owing probably to its enormous temperature, is less than a quarter of the mean density of the earth.

We may therefore assume with great probability that the sun will still continue in its condensation, even if it only attained the density of the earth—though it will probably become far denser in the interior, owing to the enormous pressure—this would develop fresh quantities of heat which would be sufficient to maintain for an additional seventeen million years the same intensity of sunshine as that which is now the source of all terrestrial life.

The term of seventeen million years which I have given may, perhaps, become considerably prolonged by the gradual abatement of radiation, by the new accretion of falling meteors, and by still greater condensa-

tion than that which I have assumed in that calculation. But we know of no natural process which could spare our sun the fate which has manifestly fallen upon other suns. This is a thought which we only reluctantly admit ; it seems to us an insult to the beneficent Creative Power which we otherwise find at work in organisms, and especially in living ones. But we must reconcile ourselves to the thought that, however we may consider ourselves to be the centre and final object of creation, we are but as dust on the earth ; which again is but a speck of dust in the immensity of space ; and the previous duration of our race, even if we follow it far beyond our written history, into the era of the lake dwellings or of the mammoth, is but an instant compared with the primeval times of our planet, when living beings existed upon it, whose strange and unearthly remains still gaze at us from their ancient tombs ; and far more does the duration of our race sink into significance compared with the enormous periods during which worlds have been in process of formation, and will still continue to form when our sun is extinguished, and our earth is either solidified in cold, or is united with the ignited central body of our system.

But who knows whether the first living inhabitants of the warm sea on the young world, whom we ought perhaps to honour as our ancestors, would not have regarded our present cooler condition with as much horror as we look on a world without a sun ? Considering the wonderful adaptability to the conditions of life which all organisms possess, who knows to what degree of perfection our posterity will have been developed in seventeen million years, and whether our fossilized bones will not perhaps seem to them as monstrous as those of the *Ichthyosaurus* now do ; and whether they, adjusted for a more sensitive state of equilibrium, will not consider the extremes of temperature, within which we now exist, to be just as violent and destructive as those of the older geological times appear to us ? Yea, even if sun and earth should solidify and become motionless, who could say what new worlds would not be ready to develop life ? Meteoric stones sometimes contain hydrocarbons ; the light of the heads of comets exhibits a spectrum which is most like that of the electrical light in gases containing hydrogen and carbon. But carbon is the element, which is characteristic of organic compounds, from which living bodies are built up. Who knows whether these bodies, which everywhere swarm through space, do not scatter germs of life wherever there is a new world, which has become capable of giving a dwelling-place to organic bodies. And this life we might perhaps consider as allied to ours in its primitive germ, however different might be the form which it would assume in adapting itself to its new dwelling-place.

However this may be, that which most arouses our moral feelings at the thought of a future, though possibly very remote, cessation of all living creation on the earth is more particularly the question whether all this life is not aimless sport, which will ultimately fall a prey to destruction by brute force. Under the light of Darwin's great thought, we begin to see that, not only pleasure and joy, but also pain, struggle, and death, are the powerful means by which Nature has built up her finer and more perfect forms of life. And we men know more particularly that in our intelligence, our civic order, and our morality we are living on the inheritance which our forefathers have gained for us, and that which we acquire in the same way will, in like manner, ennoble the life of our posterity. Thus the individual, who works for the ideal objects of humanity, even if in a modest position, and in a limited sphere of activity, may bear without fear the thought that the thread of his own consciousness will one day break. But even men of such free and large order of minds as Lessing and David Strauss could not reconcile themselves to the thought of a final destruction of the living race, and with it of all the fruits of all past generations.

As yet we know of no fact, which can be established by scientific observation, which would show that the finer and complex forms of vital motion could exist otherwise than in the dense material of organic life; that it can propagate itself as the sound-movement of a string can leave its originally narrow and fixed home and diffuse itself in the air, keeping all the time its pitch, and the most delicate shade of its colour-tint; and that, when it meets another string attuned to it, starts this again or excites a flame ready to sing to the same tone. The flame even, which of all processes in inanimate nature is the closest type of life, may become extinct, but the heat which it produces continues to exist—indestructible, imperishable, as an invisible motion, now agitating the molecules of ponderable matter, and then radiating into boundless space as the vibration of an ether. Even there it retains the characteristic peculiarities of its origin, and it reveals its history to the enquirer who questions it by the spectroscope. United afresh, these rays may ignite a new flame, and thus, as it were, acquire a new bodily existence.

Just as the flame remains the same in appearance, and continues to exist with the same form and structure, although it draws every minute fresh combustible vapour, and fresh oxygen from the air, into the vortex of its ascending current; and just as the wave goes on in unaltered form, and is yet being reconstructed every moment from fresh particles of water, so also in the living being it is not the definite mass of substance which now constitutes the body, to which the continuance of the individual is attached. For the material of the body, like that of the flame, is

subject to continuous and comparatively rapid change—a change the more rapid the livelier the activity of the organs in question. Some constituents are renewed from day to day, some from month to month, and others only after years. That which continues to exist as a particular individual is like the flame and the wave—only the form of motion which continually attracts fresh matter into its vortex and expels the old. The observer with a deaf ear only recognizes the vibration of sound as long as it is visible and can be felt, bound up with heavy matter. Are our senses, in reference to life, like the deaf ear in this respect ?

THOMAS HENRY HUXLEY

(1825-1895).

FOR a quarter of a century after Darwin began his work as a biologist, not only scientific but popular interest in the study of the physiology of animal life increased progressively. Darwin was never a popular writer, and his conclusions are so involved in the immense mass of facts he accumulated that he would never have been generally intelligible to busy people except for the work of such interpreters as Huxley—perhaps the ablest, as he was certainly the most eloquent and entertaining of all the naturalists whom Darwin's labours inspired to attempt to solve the problem of the origin of life. As Huxley presently declared that there was no scientific solution for it, that life and matter in their origin are scientifically "unknowable," he presently came to be recognized as the head of the "Agnostic School." Indeed, he himself invented this term to describe his conclusions. He was born near London, May 4th, 1825, and educated at Ealing School and Charing Cross Hospital. His professional career, begun as an assistant surgeon in the English navy, ended with the highest honours scientific England had to give—including the rectorship of Aberdeen University and the presidency of the Royal Society. He died June 24th, 1895.

THE THREEFOLD UNITY OF LIFE

(Exordium of the Address, "The Physical Basis of Life," delivered at Edinburgh, November 8th, 1868).

IN order to make the title of this discourse generally intelligible, I have translated the term "Protoplasm," which is the scientific name of the substance of which I am about to speak, by the words "the physical basis of life." I suppose that to many the idea that there is such a thing as a physical basis, or matter, of life may be novel—so widely spread is the conception of life as a something which works through matter, but is independent of it; and even those who are aware that matter and life are inseparably connected may not be prepared for the conclusion plainly suggested by the phrase, "the physical basis or matter of life," that there is some one kind of matter which is common to all

living beings, and their endless diversities are bound together by a physical as well as an ideal, unity. In fact, when first apprehended, such a doctrine as this appears almost shocking to common sense.

What, truly, can seem to be more obviously different from one another, in faculty, in form, and in substance, than the various kinds of living beings? What community of faculty can there be between the brightly-coloured lichen, which so nearly resembles a mere mineral incrustation of the bare rock on which it grows, and the painter, to whom it is instinct with beauty, or the botanist, whom it feeds with knowledge?

Again, think of the microscopic fungus—a mere infinitesimal ovoid particle, which finds space and duration enough to multiply into countless millions in the body of a living fly; and then of the wealth of foliage, the luxuriance of flower and fruit which lies between this bald sketch of a plant and the giant pine of California, towering to the dimensions of a cathedral spire, or the Indian fig, which covers acres with its profound shadow, and endures while nations and empires come and go around its vast circumference. Or, turning to the other half of the world of life, picture to yourself the great Finner whale, hugest of beasts that live, or have lived, disporting his eighty or ninety feet of bone, muscle, and blubber, with easy roll, among waves in which the stoutest ship that ever left dockyard would founder hopelessly; and contrast him with the invisible animalcules—mere gelatinous specks, multitudes of which could, in fact, dance upon the point of a needle with the same ease as the angels of the Schoolmen could, in imagination. With these images before your minds, you may well ask what community of form or structure is there between the animalcule and the whale; or between the fungus and the fig tree. And, *a fortiori*, between all four.

Finally, if we regard substance, or material composition, what hidden bond can connect the flower which a girl wears in her hair and the blood which courses through her youthful veins; or what is there in common between the dense and resisting mass of the oak, or the strong fabric of the tortoise, and those broad disks of glassy jelly which may be seen pulsating through the waters of a calm sea, but which drain away to mere films in the hand which raises them out of their element.

Such objections as these must, I think, arise in the mind of every one who ponders for the first time upon the conception of a single physical basis of life, underlying all the diversities of vital existence; but I propose to demonstrate to you that, notwithstanding these apparent difficulties, a threefold unity—namely, a unity of power or faculty, a unity of form, and a unity of substantial composition—does pervade the whole living world.

No very abstruse argumentation is needed, in the first place, to prove that the powers or faculties of all kinds of living matter, diverse as they may be in degree, are substantially similar in kind.

Goethe has condensed a survey of all the powers of mankind into the well-known epigram :—

“ Why are the people thus busily moving ? For food they are seeking,
Children they fain would beget, feeding them well as they can.
Traveller, mark this well, and, when thou art home, do thou likewise !
More can no mortal effect, work with what ardour he will.”

In physiological language, this means that all the multifarious and complicated activities of man are comprehensible under three categories. Either they are immediately directed toward the maintenance and development of the body, or they effect transitory changes in the relative positions of parts of the body, or they tend toward the continuance of the species. Even those manifestations of intellect, of feeling, and of will, which we rightly name the higher faculties, are not excluded from this classification, inasmuch as to every one but the subject of them, they are known only as transitory changes in the relative positions of parts of the body. Speech, gesture, and every other form of human action are, in the long run, resolvable into muscular contraction, and muscular contraction is but a transitory change in the relative positions of the parts of a muscle. But the scheme which is large enough to embrace the activities of the highest form of life covers all those of the lower creatures. The lowest plant, or animalcule, feeds, grows, and reproduces its kind. In addition, all animals manifest those transitory changes of form which we class under irritability and contractility ; and it is more than probable that, when the vegetable world is thoroughly explored, we shall find all plants in possession of the same powers, at one time or other of their existence. . . .

And now, what is the ultimate fate, and what the origin, of the matter of life ?

Is it, as some of the older naturalists supposed, diffused throughout the universe in molecules, which are indestructible and unchangeable in themselves ; but, in endless transmigration, unite in innumerable permutations into the diversified forms of life we know ? Or is the matter of life composed of ordinary matter, differing from it only in the manner which its atoms are aggregated ? Is it built up of ordinary matter, and again resolved into ordinary matter when its work is done ?

Modern science does not hesitate a moment between these alternatives Physiology writes over the portals of life—

“*Debemur morti nos nostraque,*”

with a profounder meaning than the Roman poet attached to that melancholy line. Under whatever disguise it takes refuge, whether fungus or oak, worm or man, the living protoplasm not only ultimately dies and is resolved into its mineral and lifeless constituents, but is always dying, and, strange as the paradox may sound, could not live unless it died.

In the wonderful story of the ‘*Peau de Chagrin*,’ the hero becomes possessed of a magical wild ass’s skin which yields him the means of gratifying all his wishes. But its surface represents the duration of the proprietor’s life; and for every satisfied desire the skin shrinks in proportion to the intensity of fruition, until at length life at the last handbreadth of the *peau de chagrin* disappears with the gratification of a last wish.

Balzac’s studies had led him over a wide range of thought and speculation, and his shadowing forth of physiological truth in this strange story may have been intentional. At any rate, the matter of life is a veritable *peau de chagrin*, and for every vital act it is somewhat the smaller. All work implies waste, and the work of life results, directly or indirectly, in the waste of protoplasm.

Every word uttered by a speaker costs him some physical loss; and in the strictest sense, he burns that others may have light—so much eloquence, so much of his body resolved into carbonic acid, water, and urea. It is clear that this process of expenditure cannot go on for ever. But, happily, the protoplasmic *peau de chagrin* differs from Balzac’s in its capacity of being repaired, and brought back to its full size, after every exertion.

For example, this present lecture whatever its intellectual worth to you, has a certain physical value to me, which is, conceivably, expressible by the number of grains of protoplasm and other bodily substance wasted in maintaining my vital processes during its delivery. My *peau de chagrin* will be distinctly smaller at the end of the discourse than it was at the beginning. By and by, I shall probably have recourse to the substance commonly called mutton, for the purpose of stretching it back to its original size. Now this mutton was once the living protoplasm, more or less modified, of another animal—a sheep. As I shall eat it, it is the same matter altered, not only by death, but by exposure to sundry artificial operations in the process of cooking.

But these changes, whatever be their extent, have not rendered it incompetent to resume its old functions as a matter of life. A singular inward laboratory, which I possess, will dissolve a certain portion of the modified protoplasm; the solution so formed will pass into my veins; and the subtle influences to which it will then be subjected will convert the dead protoplasm into living protoplasm, and transubstantiate sheep into man.

Nor is this all. If digestion were a thing to be trifled with, I might sup upon lobster, and the matter of life of the crustacean would undergo the same wonderful metamorphosis into humanity. And were I to return to my own place by sea, and undergo shipwreck, the crustacea might, and probably would, return the compliment, and demonstrate our common nature by turning my protoplasm into living lobster. Or, if nothing better were to be had, I might supply my wants with mere bread, and I should find the protoplasm of the wheat plant to be convertible into man, with no more trouble than that of the sheep, and with far less, I fancy, than that of the lobster.

Hence, it appears to be a matter of no great moment what animal or what plant I lay under contribution for protoplasm, and the fact speaks volumes for the general identity of that substance in all living beings. I share this catholicity of assimilation with other animals, all of which, so far as we know, could thrive equally well on the protoplasm of any of their fellows, or of any plant; but here the assimilative powers of the animal world cease. A solution of smelling-salts in water, with an infinitesimal proportion of some other saline matters, contains all the elementary bodies which enter into the composition of protoplasm; but, as I need hardly say, a hogshead of that fluid would not keep a hungry man from starving, nor would it save any animal whatever from a like fate. An animal cannot make protoplasm, but must take it ready-made from some other animal or some plant—the animal's highest feat of constructive chemistry being to convert dead protoplasm into that living matter of life which is appropriate to itself.

Therefore, in seeking for the origin of protoplasm, we must eventually turn to the vegetable world. The fluid containing carbonic acid, water, and ammonia, which offers such a Barmecide feast to the animal, is a table richly spread to multitudes of plants; and, with a due supply of only such materials, many a plant will not only maintain itself in vigour, but grow and multiply until it has increased millionfold, or a million millionfold the quantity of protoplasm which it originally possessed; in this way building up the matter of life to an indefinite extent from the common matter of the universe.

HUGH LATIMER

(c. 1490-1555).

THE exact date of Latimer's birth is in dispute, but beyond all doubt it was on October 16th, 1555, that he was burned at Oxford, "stroking his face with his hands and as it were bathing in the fire." While Bishop of Worcester, under Henry VIII, he himself had officiated as priest at the burning of Forest, a friar who taught religious doctrine which seemed as treasonable to Henry as Latimer's did to Mary. Under the Tudors and Stuarts, even until the close of Charles the Second's reign, the stake and scaffold were used without hesitation as means of suppressing heresy. It was the custom, however, to convict, not for heresy, but for high treason, so that not a few who went to the stake or died on the gallows, expecting the crown of martyrdom, appear on the court records as traitors. David Lewis, Roman Catholic Bishop of Llandaff and Jesuit, who was hanged, disembowelled, and quartered under Charles II., for "treasonably" acting as priest under authority from the Pope instead of the King, said on the scaffold: "I die for conscience and religion, and dying upon such good scores, as far as human frailty permits, I die with alacrity,"—a noble saying, even if it does not equal in picturesque eloquence Latimer's greeting to Ridley when they met at the stake: "Be of good comfort, Master Ridley, and play the man, for we shall this day light such a candle, by God's grace, in England as I trust shall never be put out." After saying this, Latimer "received the flame as it were embracing it," and "soon died, as it appeared, with very little pain or none."

He was born in Leicestershire somewhere between 1472 and 1490,—the best authorities fixing the date about 1490. His father, though a small yeoman farmer, educated him at Cambridge "in the knowledge of all good literature," and at home was "diligent to teach him to shoot." After becoming a priest and obtaining the benefice of West Kington, he was cited before the Bishop of London on a charge of heresy, and on April 10th, 1532, recanted, and kept his place in the priesthood. In 1534 he was made a Royal Chaplain, and in 1535 Bishop of Worcester, a position he resigned four years later because of differences of opinion with the King, through whose favour he had been promoted. Under Edward VI. he was again in favour at Court, but on the accession of

Mary he recognized his martyrdom as inevitable, and waited for it with the same resolution he shows in his sermon, 'Duties and Respect of Judges.' His style as an orator is admirable, not surpassed in English prose until Bacon began to speak and write.

ENCLOSING THE COMMON LANDS

(In 1549, Latimer preached his Seven Famous "Friday Sermons in Lent before the King's Majesty Edward VI., within His Grace's Palace at Westminster." The first Sermon was delivered on Friday, March 8th, the text was Rom. xv., 4).

WELL : then, if God will not allow a king too much. Whether will he allow a subject too much ? No, that he will not. Whether have any men here in England too much ? I doubt most rich men have too much, for without too much we can get nothing. As for example. The physician. If the poor man be diseased, he can have no help without too much. And of the lawyer the poor man can get no counsel, expedition, nor help in his matter, except he give him too much. At merchants' hands no kind of wares can be had, except we give for it too much. You landlords, you rent-raisers, I may say you steplords, you unnatural lords, you have for your possessions yearly too much. For that herebefore went for twenty or forty pound by year (which is an honest portion to be had gratis in one lordship of another man's sweat and labour), now is it let for fifty or a hundred pound by year. Of this too much cometh this monstrous and portentous dearth made by man, notwithstanding God doth send us plentifully the fruits of the earth, mercifully, contrary unto our deserts. Notwithstanding too much, while these rich men have causeth such dearth that poor men (which live of their labour) cannot with the sweat of their face have a living, all kind of victuals is so dear, pigs, geese, capons, chickens, eggs.

These things with other are so unreasonably enhanced. And I think verily that if this continue, we shall at length be constrained to pay for a pig a pound. I will tell you, my lords and masters, this is not for the king's honour. . . . It is the king's honour that his subjects be led in the true religion. That all his prelates and clergy be set about their work in preaching and studying, and not to be interrupted from their charge. Also it is the king's honour that the common wealth be advanced, that the dearth of these foresaid things be provided for, and the commodities of this realm so employed as it may be to the setting his subjects on work, and keeping them for idleness. And herein

resteth the king's honour and his office. So doing, his account before God shall be allowed and rewarded. Furthermore, if the king's honour (as some men say) standeth in the great multitude of people. Then these graziers, inclosers, and rent-rearers are hinderers of the king's honour. For where as have been a great many of householders and inhabitants, there is now but a shepherd and his dog, so they hinder the king's honour most of all. . . . I know where is a great market town with divers hamlets and inhabitants, where do rise yearly of their labours to the value of fifty pound, and the vicar that serveth (being so great a cure) hath but twelve or fourteen marks by year, so that of this pension he is not able to buy him books, nor give his neighbour drink, all the great gain goeth another way. My father was a yeoman, and had no lands of his own, only he had a farm of three or four pound by year at the uttermost, and hereupon he tilled so much as kept half a dozen men. He had walk for a hundred sheep, and my mother milked thirty kine. He was able, and did find the king a harness, with himself, and his house, while he came to the place that he should receive the king's wages. I can remember that I buckled his harness, when he went unto Blackheath field. He kept me to school, or else I had not been able to have preached before the king's majesty now. He married my sisters with five pound or twenty nobles apiece, so that he brought them up in godliness, and fear of God.

He kept hospitality for his poor neighbours. And some alms he gave to the poor, and all this did he of the said farm. Where he that now hath it payeth sixteen pound by year or more, and is not able to do anything for his prince, for himself, nor for his children, or give a cup of drink to the poor. Thus all the enhancing and rearing goeth to your private commodity and wealth. So that where you had a single too much, you have that ; and since the same, ye have enhanced the rent, and so have increased another too much. So now ye have double too much, which is too much. But let the preacher preach till his tongue be worn to the stumps, nothing is amended. We have good statutes made for the common wealth as touching commoners, enclosers, many meetings, and sessions, but in the end of the matter there cometh nothing forth. Well, well, this is one thing I will say unto you, from whence it cometh I know, even from the devil. I know his intent in it. For if ye bring it to pass that the yeomanry be not able to put their sons to school (as indeed universities do wondrously decay already), and that they be not able to marry their daughters to the avoiding of dishonour, I say ye pluck salvation from the people, and utterly destroy the realm. For by yeomen's sons the faith of Christ is and hath been maintained chiefly. Is this realm taught by rich men's sons? No, no ; read the

Chronicles, ye shall find sometime noble men's sons which have been unpreaching bishops and prelates, but ye shall find none of them learned men. But verily they that should look to the redress of these things be the greatest against them. In this realm are a great many of folks, and amongst many I know but one of tender zeal, at the motion of his poor tenants, hath let down his lands to the old rents for their relief. For God's love, let not him be a Phoenix, let him not be alone. Let him not be an hermit closed in a wall, some good man follow him, and do as he giveth example. Surveyors there be that greedily gorge up their covetous guts, handmakers I mean (honest men I touch not), but all such as survey they make up their mouths, but the commons be utterly undone by them. Whose bitter cry ascending up to the ears of the God of Sabaoth, the greedy pit of hell-burning fire (without great repentance) do tarry and look for them. A redress God grant. For surely, surely, but that two things do comfort me, I would despair of the redress in these matters. One is, that the king's majesty, when he cometh to age, will see a redress of these things so out of frame. Giving example by letting down his own lands first, and then 'enjoin his subjects to follow him. The second hope I have is, I believe that the general accounting day is at hand, the dreadful day of judgment I mean, which shall make an end of these calamities and miseries.

SIR OLIVER JOSEPH LODGE

(1851-).

THE "New Thought" of the first generation of the Twentieth Century in England, the United States and Italy was characterized by a remarkable reaction against what in the Nineteenth Century was called "materialism" and "agnosticism." Celebrated in mathematics and physics, Sir Oliver Lodge, as president of the Society for Psychical Research (1901-1904), devoted great intellectual power to the investigation of telepathy, spiritual manifestations and similar phenomena. As a representative of Nineteenth Century science, Herbert Spencer offered his school an explanation for the wide popularity of this phase of research as an inevitable result of excessive tension in war periods of "recrudescence" for what Spencer considered primitive instincts. This is to be considered only as evidence of the "inevitable conflict" between irreconcilable views of the meaning of science. Sir Oliver Lodge was born in Staffordshire, June 12th, 1851, and was educated at University College, London. He was knighted in 1902 as a recognition of distinguished achievements in physics, mathematics and other fields of science. His more recent publications include "Electrons," "Life and Matter" and "Raymond."

ELECTRONS AND THE INFINITY OF THE UNIVERSE

(An Address on "Electricity and Matter," delivered by Sir Oliver Lodge, at Bedford College for Women, February 5th, 1908).

THE number of vibrations which constitute visible light is from 400 to 800 million per second ; and although it is no great distance round an atom, yet these particles have to go at very high speed ; hence, naturally, some of them occasionally fly off. This will occur from various causes ; they will fly off under the action of ultra-violet light, and so give rise to leakage of negative electricity. But there are certain substances which will emit these particles without any stimulus, and the first discovered was uranium. Although there may be an aluminium or other screen between a piece of uranium and a photographic plate, something will penetrate through to the photographic plate. This

constituted the discovery by Becquerel of the radio-activity of substances. In the researches of Dr. Russell, various substances were found to possess this quality of giving out something on their own account. But the subject has gone ahead very far and fast. The most important developments have been made by Monsieur and Madame Curie in France, discovering polonium and radium, which latter has the properties possessed by uranium in a most extraordinary degree. The rays given off by these substances are of extraordinary interest; they have marvellous penetrating powers and are very intense, more intense than the X-rays given by a Roentgen tube. Radium rays will not only penetrate a foot of aluminium or wood, but they will penetrate three-eighths of an inch of lead, and then be as strong as are the rays from uranium. The full mechanism of the giving off of this great amount of radiation has still to be further investigated. It is a kind of electric evaporation, an emission of particles. This seems clear. There are three kinds of radiation: (1) Particles which are readily stopped by obstacles, absorbable rays; (2) the particles which penetrate obstacles with singularly penetrating power; and (3) the ordinary X-rays. X-rays are waves in the ether—not light, but something of that nature; the penetrating rays are electrons which are shot off. But the most interesting are the first rays, those which are easily stopped; for these turn out to be atoms of matter shot off with a speed comparable to that of light. It is the first time that matter has ever been known to have such a speed as that. Rutherford, now of Montreal, has measured for the first time the speed of these readily stopped absorbable particles, and also their mass. He shows that they are atoms of matter, and that they are moving with one-tenth of the velocity of light.

All hot bodies and all negatively charged bodies are now believed to be giving off these particles; radio-activity is becoming quite a common feature. Recently fallen rain drops are radio-active, leaves of plants and most things in sunshine are radio-active; the difficulty will be to find something which is not radio-active in some degree, and the commonest kind of radio-activity appears to be the detachment of an electron. Loose charges seem to fly off, apparently by centrifugal force or the jostling of the atoms.

The size of electrons is known, on the hypothesis that the atom of matter is composed of them, i.e., on the hypothesis that the inertia of matter is electrical, or that it is electrically composed of the inertia of these charges. Evidence of this is accumulating, and there is reason to believe, not only on philosophical grounds, but in accordance with direct physical experiment, that electric inertia is the only inertia that exists. The size of an electron can easily be determined. Regard the

radius as unknown, the charge as known, the mass as known ; then the size is at once calculable. The size of these electrons is about one hundred-thousandth part of the diameter of an atom, otherwise they would not have sufficient inertia. They are the smallest bodies known. . . .

The relation of the electron to the atom is a matter of the most intense interest. But it is not to be supposed that the electron is stationary in the atom. The electrons are revolving round one another at tremendous speed, so that the atom is a region of intense activity. The fact is, we come to an atomic astronomy, and the atom is becoming like a solar system, or like nebulae or Saturn's rings or something of that kind, composed of a number of small particles in a violent state of revolving motion and occupying very little of the whole space with their actual substance. They are so small that collisions are infrequent. So it is in the solar system and heavens generally ; collisions do occur, but seldom, because of the excessively small sizes compared with the distances at which they are spaced out.

Taking any family belonging to a sun, i.e., a solar system, it forms something like the same kind of collection as the electrons form in an atom. So when we get in an atom a sort of solar system we begin to question whether there is anything in absolute size at all. It is a question I cannot answer. It has been suggested that solar systems may be atoms of a still larger universe. These are questions that are too hard. But there appears to be no end to the infinity of the universe, and all that we can say is that the probability is that it is infinite in an infinite number of ways.

SIR JAMES MACKINTOSH

(1765-1832).

ONE of the greatest events in modern times was the adoption by England of the policy of "autonomy," advocated by Sir James Mackintosh in his speech of May 2nd, 1828. Nothing else could have saved the British Empire from collapse. The Tories, whose policies resulted in the loss of the American colonies, fought "autonomy" at every point. The Napoleonic Wars and the American War of 1812 enabled them to sustain themselves by appeal to British patriotism, but it became apparent, nevertheless, that the centralized military empire, which constituted their ideal, was impossible with England as the central power. When Mackintosh boldly declared in Parliament that in every country the majority of the inhabitants and property owners "ought to possess the power of the government," he was merely vindicating principles he had held during the whole of his public life—often in what seemed to be a hopeless minority. Now, however, they were to be vindicated. As a result of them, Canada and Australia became autonomous, and the British Empire survived.

Mackintosh was born near Inverness, Scotland, in 1765. He was educated at Aberdeen and Edinburgh, graduating in medicine and removing to London for the practice of that profession, which in 1795 he abandoned for the law. His defence of Peltier in 1803 made him a great reputation as a lawyer. He had already become celebrated as a political writer by reason of his reply to Burke's 'Reflections on the French Revolution.' This reply, published in April 1791, was to some extent discredited by subsequent events of the reign of Terror and Mackintosh evidently had this fact in mind in the striking review of the Revolution he made in the case of Peltier. He remained a consistent Whig until his death however, and though never popular as a political orator, he was one of the decisive factors in making the English history of the first quarter of the nineteenth century. He was Recorder and Judge of the court of Vice-Admiralty at Bombay from 1804 to 1811. After his return to England, he entered Parliament and devoted the remainder of his life to unrelenting work in literature, philosophy, and public

affairs. He died in London, May 30th, 1832. Among his best-remembered works are his 'Vindiciæ Gallicæ,' in reply to Burke; his 'Dissertation on the Progress of Ethical Philosophy'; and his 'History of the Revolution in England in 1688.'

CANADA AND COLONIAL AUTONOMY

(Delivered in the House of Commons on May 2nd, 1828).

I THINK I may interpret fairly the general feeling of the House, when I express my congratulations upon the great extent of talent and information which the honourable Member for St. Michael's has just displayed, and that I may venture to assert he has given us full assurance, in his future progress, of proving a useful and valuable Member of the Parliament of this country. I cannot, also, avoid observing that the laudable curiosity which carried him to visit that country whose situation is now the subject of discussion, and still more the curiosity which led him to visit that imperial Republic which occupies the other best portion of the American continent, gave evidence of a mind actuated by enlarged and liberal views.

After having presented a petition signed by eighty-seven thousand of the inhabitants of Lower Canada,—comprehending in that number nine-tenths of the heads of families in the province, and more than two-thirds of its landed proprietors,—and after having shown that the petitioners had the greatest causes of complaint against the administration of the government in that colony, it would be an act of inconsistency on my part to attempt to throw any obstacle in the way of that inquiry which the right honourable gentleman proposes. It might seem, indeed, a more natural course on my part if I had seconded such a proposition. Perhaps I might have been contented to give a silent acquiescence in the appointment of a committee and to reserve any observations I may have to offer until some specific measure is proposed, or until the house is in possession of the information which may be procured through the labour of the committees—perhaps, I say, I might have been disposed to adopt this course if I had not been intrusted with the presentation of that petition. But I feel bound by the sense of the trust reposed in me to allow no opportunity to pass over of calling the attention of the House to the grievances of the petitioners and to their claims for redress and for the maintenance of their legitimate rights. This duty I hold myself bound to execute, according to the best of my ability, without sacrificing my judgment, or rendering it subordinate to any sense of duty,

but feeling only that the confidence of the petitioners binds me to act on their behalf, and as their advocate, in precisely the same manner, and to the same extent, as if I had been invested with another character, and authorized to state their complaints in a different situation.

To begin, then, with the speech of the right honourable gentleman, I may take leave to observe that all that was contained in the latter part of it has my fullest and most cordial assent. In 1822, when the Canadians were last before the House, I stated the principles which ought to be maintained with respect to what the right honourable gentleman has very properly and very eloquently called the "Great British Confederacy." I hold now, as I did then, that all the different portions of that Confederacy are integral parts of the British Empire, and as such are entitled to the fullest protection. I hold that they are all bound together as one great class by an alliance prior in importance to every other,—more binding upon us than any treaty ever entered into with any State,—the fulfilment which we can never desert without the great sacrifice of a moral duty. I hold that it can be a matter of no moment, in this bond of alliance, whether the parties be divided by oceans or be neighbours, I hold that the moral bond of duty and protection is the same. My maxims of colonial policy are few and simple : a full and efficient protection from all foreign influence ; full permission to conduct the whole of their own internal affairs ; compelling them to pay all the reasonable expenses of their own government and giving them at the same time a perfect control over the expenditure of the money ; and imposing no restrictions of any kind upon the industry or traffic of the people. These are only the means by which the hitherto almost incurable evil of distant government can either be mitigated or removed. And it may be a matter of doubt whether in such circumstances the colonists would not be under a more gentle control in a happier state than if they were to be admitted to a full participation in the rule and brought under the immediate and full protection of the present government. I agree most fully with the honourable gentleman who spoke last, when he expressed a wish that we should leave the regulation of the internal affairs of the colonies to the colonists, except in cases of the most urgent and manifest necessity. The most urgent and manifest necessity, I say ; and few and rare ought to be the exceptions to the rule, even upon the strength of those necessities.

Under these circumstances of right I contend it is prudent to regard all our colonies, and peculiarly the population of these two great provinces,—provinces placed in one of those rare and happy states of society in which the progress of population must be regarded as a blessing to mankind,—exempt from the curse of fostering slavery,—exempt from the evils produced by the contentions of jarring systems of religion,—

enjoying the blessings of universal toleration,—and presenting a state of society the most unlike that can be possibly imagined to the fastidious distinctions of Europe. Exempt at once from the slavery of the West and the castes of the East,—exempt, too, from embarrassments of that other great continent which we have chosen as a penal settlement and in which the prejudices of society have been fostered, I regret to find, in a most unreasonable degree,—exempt from all the artificial distinctions of the Old World, and many of the evils of the New, we see a great population rapidly growing up to be a great nation. None of the claims of such a population ought to be cast aside, and none of their complaints can receive any but the most serious consideration.

In the first part of his speech the right honourable gentleman declared that the excesses and complaints of the colonists arose from the defect of their Constitution, and next from certain contentions into which they had fallen with Lord Dalhousie. In anything I may say on this occasion I beg to be understood as not casting any imputation upon the character of that noble lord ; I speak merely of the acts of his government, and I wish solely to be understood as saying that my opinion of the acts of that government are different from those which I believe to have been conscientiously his.

I, however, must say that I thought the right honourable gentleman in one part of his address indulged himself in some pleasantries which seemed ill suited to the subject to which he claimed our attention,—I allude to the three essential grievances which he seemed to imagine led to many, if not all, of the discontents and complaints of the colonists. There was the perplexed system of real property law, creating such a vexatious delay and such enormous costs to the suitor as to amount very nearly to a denial of justice ; this, he said, arose from adhering to the custom of Paris. The next cause of discontent is in the inadequate representation of the people in Parliament ; that he recommended to the immediate attention of the committee for the purpose of revision. Lastly, the members of the legislature were so absurdly ignorant of the first principles of political economy as to have attempted to exclude all the industry and capital of other countries from flowing in to enrich and fertilize their shores. These were the three grounds upon which he formally impeached the people of Canada before the knights, citizens, and burgesses of Great Britain and Ireland, in Parliament assembled.

Did the right honourable gentleman never hear of any other system of law, in any other country than Canada, in which a jumble of obsolete usages were mixed up and confounded with modern subtleties, until the minds of the most acute men of the age and nation—men who had in a service of forty years passed through every stage of its gradations—

were driven to declare that they felt totally unable to find their way through its labyrinths, and were compelled by their doubts of what was law and what was not, to add in a most ruinous degree to the expenses of the suitor? This system has been called the "Common Law,"—"the wisdom of our ancestors,"—and various other venerable names. Did he never hear of a system of representation in any other country totally irreconcilable either with the state of the population or with any rule or principle under heaven? Have I not heard over and over again from the lips of the right honourable gentleman, and from one whom, alas! I shall hear no more, that this inadequate system of representation possessed extraordinary advantages over the more systematic contrivances which resulted from the studies of the "constitution makers" of other countries. And yet it is for this very irregularity in their mode of representation that the Canadians are now to be brought before the judgment of the right honourable gentleman's committee. I felt still greater wonder, however, when I heard him mention this third ground of objection to the proceedings of the colonists, and his third cause of their discontent—their ignorance of political economy. Too surely the laws for the exclusion of the capital and industry of other countries did display the grossest ignorance of that science! I should not much wonder if I heard of the Canadians devising plans to prevent the entrance of a single grain of foreign corn into the provinces. I should not wonder to hear the members of their legislature and their great landowners contending that it was absolutely necessary that the people should be able to raise all their own food; and consequently (although, perhaps, they do not see the consequences) to make every other nation completely independent of their products and their industry. It is perhaps barely possible that some such nonsense as this might be uttered in the legislative assembly of the Canadians.

Then again, sir, the right honourable gentleman has alluded to the seigneurs and their vassals. Some of these "most potent, grave, and reverend" seigneurs may happen to be jealous of their manorial rights; for seigneuralty means manor, and a seigneur is only, therefore, a lord of the manor. How harmless this lofty word seems to be when translated. Some of these seigneurs might happen, I say, to be jealous of their manorial privileges, and anxious for the preservation of their game. I am a very bad sportsman myself, and not well acquainted with the various objects of anxiety to such persons; but there may be, too, in these colonies also, persons who may take upon themselves to institute a rigorous inquiry into the state of their game, and into the best methods of preserving red game and black game, and pheasants and partridges; and who might be disposed to make it a question whether any evils arise from

the preservation of these things for their sport, or whether the safety, the liberty, and the life of their fellow subjects ought not to be sacrificed to their personal gratification.

With regard to the observance of the custom of Paris, I beg the House to consider that no change was effected from 1760 to 1789, and (although I admit with the right honourable gentleman that it may be bad as a system of conveyance, and may be expensive on account of the difficulties produced by mortgages) that the Canadians cannot be very ill off under a code of laws which grew up under the auspices of the Parliament of Paris—a body comprising the greatest learning and talent ever brought to the study of the law, and boasting the names of L'Hôpital and Montesquieu.

Neither can it be said that the assembly of Canada was so entirely indifferent to its system of representation ; for it ought to be recollected that they passed a bill to amend it, which was thrown out by the council,—that is, in fact, by the government. At all events, this shows that there was no want of a disposition to amend the state of their representation, although government might differ from them as to the best method of accomplishing it. A bill for establishing the independence of the judges was another remedial measure thrown out by the Upper House.

As at present informed, however, without going further into these questions, I see enough stated in the petition upon the table of the House to justify the appointment of a committee of inquiry.

In every country, sir, the wishes of the greater number of the inhabitants, and of those in possession of the great mass of the property, ought to have great influence in the government—they ought to possess the power of the government. If this be true generally, the rule ought, *a multo fortiori*, to be followed in the government of distant colonies, from which the information that is to guide the government at home is sent by a few, and is never correct or complete. A government on the spot, though with the means of obtaining correct information, is exposed to the delusions of prejudice ; for a government at a distance, the only course to pursue is to follow public opinion. In making the practical application of this principle, if I find the government of any country engaged in squabbles with the great mass of the people,—if I find it engaged in vexatious controversies and ill-timed disputes,—especially if that government be the government of a colony,—I say that there is a reasonable presumption against that government. I do not charge it with injustice, but I charge it with imprudence and indiscretion ; and I say that it is unfit to hold the authority intrusted to it. The ten years of hostility and squabbles which have existed in this instance are a sufficient charge against this government.

I was surprised to hear the right honourable gentleman put the people and the government on the same footing in this respect. What is government good for, if not to temper passion with wisdom? The people are said to be deficient in certain qualities, and government is said to possess them. If the people are not deficient in them, it is a fallacy to talk of the danger of intrusting them with political power; if they are deficient, where is the common sense of expecting of them that moderation which government is instituted for the very purpose of supplying?

GUGLIELMO MARCONI

(1874-).

GUGLIELMO MARCONI, the famous Italian electrical engineer and inventor of the Marconi system of wireless telegraphy, was born at Bologna. He was educated at Leghorn and Bologna University, and it was at his birthplace that he made his first wireless experiments.

In England his earliest wireless messages were sent between Penarth and Weston-super-Mare, and also transmitted across Salisbury Plain in 1897. Two years later he succeeded in telegraphing by wireless across the Channel, and a system of regular supermarine communication was begun by two limited companies, Marconi's Wireless Telegraph Company and the Marconi International Marine Communication Company. In July and August, 1899, the Marconi system had been tried satisfactorily at the British Naval Manœuvres. By 1901 this radio-telegraphy had been established on a firm industrial basis.

Marconi now turned his attention to Transatlantic communication, and in December, 1901, the difficult transmission over 3,000 miles from Cornwall to Newfoundland was accomplished, when in the latter place he heard the pre-arranged signal of three dots given out at stated hours from Poldhu.

Since that time great progress has been made in this novel branch of electricity, and it is chiefly due to the inventions of Marconi that 'wireless' is now a general household requisite. The latest extension of 'wireless' is the possibility of the broadcasting of power and the consequent reformation in industry and the amenities of life. Marconi in a recent speech has announced it to be possible, though suggesting that its solution must be left to the remote future.

He received the Nobel Prize for Physics, 1909. In 1914, King George bestowed on him the honorary G.C.V.O., and in 1915 he was appointed a Senator by the King of Italy.

RADIO COMMUNICATIONS

(Delivered in London, 1924).

I HAVE always attached considerable importance to the problem of a practical directive system of radio communication. During my earliest experiments carried out in England more than twenty-eight years ago, I was able to show the transmission and reception of intelligible signals over a distance of $1\frac{3}{4}$ miles by means of an elementary beam system employing very short waves and reflectors, whilst, curiously enough, by means of the antenna or elevated wire system utilising much longer waves, I could only at that time get results over a distance of half a mile.

The progress made with the non-directional long wave system was, however, so rapid and the results so immediately applicable to practical purposes that it very soon became, and still remains, what might be called the standard system. It is regrettable that the study of short waves was neglected for a long period of years, for these waves, which, so far, are the only ones that can be confined to narrow beams, are also capable of being employed to give practical results unobtainable by the lower frequency system, which, up to now, has held the field for long-distance communication.

When during the War in 1916 I took up the systematic study of short waves, considerable doubt existed in my mind, and in that of other workers, as to whether the range of these waves might not prove to be too small for practical and useful purposes, particularly during daytime, if they might not be altogether too untrustworthy, and also as to whether large stretches of land, and particularly mountains, would not present obstacles to their transmission over long distances.

In 1920 experiments were carried out by Capt. H. J. Round with duplex telephony on a 100 metre wave between Chelmsford and Southend, and the experiments were so successful that early in 1921 two stations which had been erected at Southwold and Zandvoord on the Dutch coast were put into commission experimentally, Southwold station utilising about 1 kilowatt to the aerial. Experiments were carried out, transmitting from these two stations to Norway in August, 1921, and at Christiansund day and night telephony was easily received from both stations. At Christiania, about 700 English miles distant, very loud and constant signals were received during the hours of darkness and in the daytime on certain days, apparently when the barometer was low.

During these experiments the curious night distortion of telephone signals was discovered, particularly when transmission was overland, the major cause of which has more recently been discovered by Capt. Round in his work on broadcasting. Later, the results of these tests were merged into the general short-wave beam experiments.

During the tests carried out on the steam yacht *Elettra* in the spring and summer of 1923, I was able to discover that the short wave I was then using could not only cover great distances by day, and much greater distances by night, but that it was also quite trustworthy and that, moreover, large parts of continents and ranges of mountains did not materially reduce its working distance.

A series of tests was for the first time carried out with short waves over what might be termed world-wide distances during the winter, spring and summer of this year, between Poldhu in Cornwall and receiving stations situated on ships at sea and also at such places as Montreal, New York, Rio de Janeiro, Buenos Ayres and Sydney (New South Wales, Australia). All these tests proved to be successful, including the first telephonic communication with Australia ever realised, although the amount of power utilised at the sending station never exceeded 20 kilowatts. Very strong signals were obtained at all these places during the hours when darkness extended over the whole distance separating each of them from Poldhu, and weaker signals for a few hours when the sun was above the horizon at either end, the intensity of the signals varying inversely in proportion to the mean altitude of the sun when above the horizon. Although the signals were received with great strength at New York, Rio, and Buenos Ayres during the time when darkness spread over the whole or at least the major part of the great circle track separating these places from Poldhu, no signals at all were ever received, during these tests, when the same track or part of space was all, or substantially all, illuminated by the light of the sun.

While this limitation of the period of working to practically the hours of darkness constituted an undoubted disadvantage, still the economical advantages, together with the trustworthiness and possibility of working this system at far greater speeds than would have been feasible with the well-known high-powered long-wave installations, went far to convince me that the short-wave beam system would be capable of transmitting a far greater number of words per 24 hours between England and far-distant countries, such as Australia, than would be possible by the comparatively powerful, cumbersome, and expensive stations actually in use, or which were planned to be used, for Imperial commercial communications. It is a satisfaction to me to be able to state that the stations intended for this purpose in England

and others to be installed in the principal Dominions and far-distant countries will all be on the beam system.

Commencing in August of this year, a further series of investigations was carried out between Poldhu and the yacht *Elettra*, the object being to endeavour, if possible, to find means of overcoming the limitations of working hours brought about by daylight, and also to test whether the effect of the reflectors would give the expected increase of signal strength over long distances. The yacht proceeded to Spain, then to Madeira, and afterwards to Italy. From Naples we sailed for Beyruth in Syria, touching at Messina and Crete, returning to Naples via Athens.

At Madeira it was ascertained that a reflector at the transmitting station increased the strength of the received signals in accordance with our calculations, but that, notwithstanding this increase of strength, when using a 92-metre wave, the daylight range was only very slightly augmented. Comparative tests were carefully carried out with waves of 92, 60, 47, and 32 metres also at other places in the Atlantic and Mediterranean.

These tests enabled us to discover that the daylight range of practical communication over long distances increased very rapidly as the wave-length was reduced, the 32-metre wave being regularly received all day at Beyruth, whilst the 92-metre wave failed to reveal itself for many hours each day even at Madeira, notwithstanding the fact that the distance between Poldhu and Madeira is 1,100 miles, entirely over sea, whilst that between Poldhu and Beyruth is 2,100 miles, practically all over mountainous land. Our observations went to confirm the fact that for waves between 100 metres and 32 metres the daylight absorption decreased very rapidly with the shortening of wave length.

These results were so interesting and satisfactory that I immediately decided to try further tests over much greater distances. In October of this year, transmission experiments were carried out on a 32-metre wave from Poldhu to specially installed receivers at Montreal, New York, Rio, Buenos Ayres, and Sydney (Australia). Although the available power utilised at Poldhu was only 12 kilowatts, it was at once found possible to transmit signals and messages to New York, Rio, and Buenos Ayres when the whole of the great circle track separating these places from Poldhu was exposed to daylight. During a complete day transmission at fixed intervals carried out last October with Sydney, New South Wales, that station received the Poldhu signals for 23½ hours out of the 24, and a 48-hour test which was only completed on December 10th fully confirmed the result.

The tests from England to places situated south of the equator, such as Sydney, Buenos Ayres, Rio de Janeiro, and Cape Town, are particularly interesting for the reason that the waves have always in these cases to traverse what may be called a summer zone. They are therefore subjected to an averaging effect of conditions, which can never possibly exist when the transmissions take place only between stations situated in the northern or southern hemispheres. During November some successful receiving tests were carried out in England from a low power transmitting station in Australia utilising waves of 87 metres. During the present month of December, trials have been continued with Canada, the United States, Brazil, the Argentine, and Australia, and also, for the first time, with Bombay and Karachi in India, and Cape Town in South Africa. The power utilised at the Poldhu station during all these tests was 15 kilowatts.

The results have fully confirmed my expectations in regard to the behaviour of the various wave-lengths over such great distances, and I have no doubt that the information gained will render possible the installation of comparatively low-power stations capable of establishing and maintaining commercial service by day and by night between England and the most distant parts of the globe.

The low costs of this system both in capital and running expenses, compared with that of the existing type of stations, must prove to be very great, and should bring about the possibility of a reduction in telegraph rates for all long-distance communications, besides making direct communication with some of the smaller outposts of the Empire commercially remunerative. Already the size and the power of some of the most modern long-wave stations were becoming a serious question from a financial point of view. The newly equipped station at Buenos Ayres, for example, which was designed primarily for communicating with Europe over a distance of about 6,000 miles, employs 800 kilowatts and an aerial supported by ten towers, each 680 feet high. This station usually works on wave-lengths of about 12,000 and 16,000 metres. Another example is the British Post Office station which is being erected near Rugby, which, when completed, will employ 1,000 kilowatts and an aerial supported by 16 towers, each 820 feet high, while the station being erected in the Union of South Africa was designed on a similar gigantic scale.

I am now firmly convinced that the beam stations employing only a small fraction of this power and much lower and fewer masts will be able to communicate at practically any time with any part of the Empire, and I cannot refrain from expressing my strong personal opinion that these powerful long-wave stations will soon be found to be uneconomical

and comparatively inefficient in so far as long-distance commercial communications are concerned. Although we have, or believe we have, all the necessary data for the generation, radiation, and reception of electrical waves, as at present utilised for long-distance communications, we are still far from possessing anything approaching an exact knowledge of the conditions governing the propagation of these waves through space. These results indicate quite definitely that the well-known Austin formula is inapplicable to these waves. Another formula will have to be devised, based on the results of further investigations.

Reflectors of practical and economical dimensions are only efficiently applicable when short waves are used, and, although very long distances have been covered by these waves without the use of directional devices, I am convinced that these will be found to be essential for ensuring the carrying out of commercial high speed services. The disadvantageous effect called "fading" is sometimes a source of serious trouble when receiving signals transmitted by means of short waves, although much less serious than when waves of several hundred metres in length⁸ are employed. According to our experience, the use of reflectors diminishes fading and also tends to overcome its effects by enormously increasing the strength and therefore the margin of readability of the received signals.

Increasingly large and expensive reflectors could, of course, be used with longer waves than 100 metres, but the result of all recent tests seem to indicate that the shorter waves present the greatest advantages, one of the most important being that their reception is very much less liable to interference by the effects of atmospheric electrical disturbances, or "X's."

If these waves are destined to carry a considerable part of the most important long-distance telegraphic traffic of the world, it may well be necessary in the near future, by international legislation, to regulate their use and safeguard them from preventable interference.

JAMES CLERK MAXWELL

(1831-1878).

JAMES MAXWELL was born at Edinburgh on the 13th of November, 1831. He received his education at Edinburgh University, afterwards entering Cambridge. Here he took his degree as a second wrangler. He held the chair of Natural Philosophy in Marischal College, Aberdeen from 1856 till the fusion of the two colleges there in 1860. For eight years subsequently he held the chair of Physics and Astronomy in King's College, London, but resigned in 1868, and retired to his estate of Glenair in Kirkcudbrightshire.

He was summoned from his seclusion in 1871, to become the first holder of the newly founded professorship of Experimental Physics in Cambridge. In this connection it may well be remembered that it was under Professor Maxwell's direction that the plans of the Cavendish Laboratory were prepared. During the process of its construction the Professor personally superintended every step of the progress of the building and of the purchase of the very valuable pieces of apparatus with which it was equipped. The expense of the whole laboratory was borne by its munificent founder, the Seventh Duke of Devonshire. Professor Maxwell died at Cambridge on the 5th of November, 1878.

As a physicist Maxwell had few equals. The greatest work of his life was devoted to the study and development of electricity. One of his last great contributions to science was the editing of the "Electrical Researches of the Hon. Henry Cavendish." In private life Clerk Maxwell was one of the most lovable of men.

MOLECULES

(Delivered before the British Association).

AN atom is a body which cannot be cut in two. A molecule is the smallest possible portion of a particular substance. No one has ever seen or handled a single molecule. Molecular science, therefore, is one of those branches of study which deal with things invisible and imperceptible by our senses, and which cannot be subjected to direct experiment.

A drop of water may be divided into a certain number, and no more, of portions similar to each other. Each of these the modern chemist calls a molecule of water. But it is by no means an atom, for it contains two different substances, oxygen and hydrogen, and by a certain process the molecule may be actually divided into two parts, one consisting of oxygen and the other of hydrogen.

We all know that air or any other gas placed in a vessel presses against the sides of the vessel, and against the surface of any body placed within it. On the kinetic theory this pressure is entirely due to the molecules striking against these surfaces, and thereby communicating to them a series of impulses which follow each other in such rapid succession that they produce an effect which cannot be distinguished from that of a continuous pressure.

If the velocity of the molecules is given, and the number varied, then since each molecule, on an average, strikes the sides of the vessel the same number of times, and with an impulse of the same magnitude, each will contribute an equal share to the whole pressure. The pressure in a vessel of given size is therefore proportional to the number of molecules in it, that is, to the quantity of gas in it.

This is the explanation of the fact discovered by Robert Boyle, that the pressure of air is proportional to its density. It shows also that of different portions of gas forced into a vessel, each produces its own part of the pressure independently of the rest, and this whether these portions be of the same gas or not.

Let us next suppose that the velocity of the molecules is increased. Each molecule will now strike the sides of the vessel a greater number of times in a second, but, besides this, the impulse of each blow will be increased in the same proportion, so that the part of the pressure due to each molecule will vary as the square of the velocity. Now the increase of velocity corresponds, on our theory, to a rise of temperature, and in this

way we can explain the effect of warming the gas, and also the law discovered by Charles that the proportional expansion of all gases between given temperatures is the same.

The dynamical theory also tells us what will happen if molecules of different masses are allowed to knock about together. Those of greater mass will go slower than the smaller ones, so that, on an average, every molecule, great or small, will have the same energy of motion. The important consequence follows that a cubic centimetre of every gas at standard temperature and pressure contains the same number of molecules. But we must now descend to particulars, and calculate the actual velocity of a molecule of hydrogen.

A cubic centimetre of hydrogen, at the temperature of melting ice and at a pressure of one atmosphere, weighs 0.00008954 grammes. We have to find at what rate this small mass must move (whether altogether or in separate molecules makes no difference) so as to produce the observed pressure on the sides of the cubic centimetre. This is the calculation which was first made by Dr. Joule, and the result is 1859 metres per second. This is what we are accustomed to call a great velocity. It is greater than any velocity obtained in artillery practice. The velocity of other gases is less, but in all cases it is very great as compared with that of bullets.

We have now to conceive of the molecule of the air in this room flying about in all directions, at the rate of about seventeen miles in a minute.

If all these molecules were flying in the same direction, they would constitute a wind blowing at the rate of seventeen miles a minute, and the only wind which approaches this velocity is that which proceeds from the mouth of a cannon. How, then, are you and I able to stand here? Only because the molecules happen to be flying in different directions, so that those which strike against our backs enable us to support the storm which is beating against our faces. Indeed, if this molecular bombardment were to cease, even for an instant, our veins would swell, our breath would leave us, and we should, literally, expire.

But it is not only against us or against the walls of the room that the molecules are striking. Consider the immense number of them, and the fact that they are flying in every possible direction, and you will see that they cannot avoid striking each other. Every time that two molecules come into collision, the path of both are changed, and they go off in new directions. Thus each molecule is continually getting its course altered, so that, in spite of its great velocity, it may be a long time before it reaches any great distance from the point at which it set out.

I have here a bottle containing ammonia—a gas which every one knows by its smell. Its molecules have a velocity of six hundred metres per second, so that if their course had not been interrupted by striking against the molecules of air in the room, any one in the farthest corner would have smelt ammonia whenever I opened the bottle,—before, indeed, I was able to pronounce the name of the gas. But instead of this, each molecule of ammonia is so jostled about by the molecules of air, that it is sometimes going one way and sometimes another, and like a hare, which is always doubling, though it goes at a great pace, it makes very little progress. Nevertheless, the smell of ammonia is now beginning to be perceptible at some distance from the bottle. The gas does diffuse itself through the air, though the process is a slow one, and if we could close up every opening in the room so as to make it air-tight, and leave everything to itself for some time, the ammonia would become uniformly mixed or inter-diffused through every part of the air in the room.

If we wish to form a mental representation of what is going on among the molecules in calm air, we cannot do better than observe a swarm of bees, when every individual bee is flying furiously, first in one direction and then in another, while the swarm, as a whole, either remains at rest, or sails slowly through the air.

The greater the velocity of the molecules and the farther they travel before their paths are altered by collision with other molecules, the more rapid will be the diffusion. Now we know already the velocity of the molecules, and therefore, by experiments on diffusion, we can determine how far, on an average, a molecule travels without striking another. This distance is called the mean path of a molecule, and it is a very small distance, quite imperceptible to us even with our best microscopes. Roughly speaking, it is about the tenth part of the length of a wave of light, which is a very small quantity. Of course the time spent on so short a path by such swift molecules must be very small. I have calculated the number of collisions which each must undergo in a second. They are reckoned by thousands of millions. No wonder that the travelling power of the swiftest molecule is but small, when its course is completely changed thousands of millions of times in a second.

The theory of liquids is not so well understood as that of gas, but the principal difference between a gas and a liquid seems to be that in a gas each molecule spends the greater part of its time in describing its free path, and is for a very small portion of its time engaged in encounters with other molecules, whereas in a liquid, the molecule has hardly any free path, and is always in a state of close encounter with other molecules.

The molecules of an element keep to a constant type with a precision which is not to be found in the sensible properties of the bodies which they

constitute. In the first place, the mass of each individual molecule, and all its other properties, are absolutely unalterable. In the second place, the properties of all molecules of the same kind are absolutely identical.

We can procure specimens of oxygen from very different sources—from the air, from water, from rocks of every geological epoch. The history of these specimens has been very different, and if, during thousands of years, difference of circumstances could produce difference of properties, these specimens of oxygen would show it.

In like manner we may procure hydrogen from water, from coal, or even from meteoric iron. Take two litres of any specimen of hydrogen, it will combine with exactly one litre of any specimen of oxygen, and will form exactly two litres of water.

Now if, during the whole previous history of either specimen, whether imprisoned in the rocks, flowing in the sea, or careering through unknown regions with the meteorites, any modification of the molecules had taken place, these relations would no longer be preserved.

But we have another and an entirely different method of comparing the properties of molecules. The molecule, though indestructible, is not a hard, rigid body, but is capable of internal movements, and when these are excited, it emits rays, the wave-length of which is a measure of the time of vibration of the molecule.

By means of the spectroscope, the wave-lengths of different kinds of light may be compared to within one ten-thousandth part. In this way it has been ascertained, not only that molecules taken from every specimen of hydrogen in our laboratories have the same set of periods of vibration, but that light, having the same set of periods of vibration, is emitted from the sun and from the fixed stars.

We are thus assured that molecules of the same nature as those of our hydrogen exist in those distant regions, or at least did exist when the light by which we see them was emitted.

In the heavens we discover by their light, and by their light alone, stars so distant from each other that no material thing can ever have passed from one to another; and yet this light, which is to us the sole evidence of the existence of these distant worlds, tells us also that each of them is built up of molecules of the same kind as those which we find on earth. A molecule of hydrogen, for example, whether in Sirius or Arcturus, executes its vibrations in precisely the same time.

Natural causes, as we know, are at work, which tend to modify, if they do not at length destroy, all the arrangements and dimensions of the earth and the whole solar system. But though in the course of ages catastrophes have occurred and may yet occur in the heavens, though

ancient systems may be dissolved and new systems evolved out of their ruins, the molecules out of which these systems are built—the foundation stones of the material universe—remain unbroken and unworn.

MAX MÜLLER

(1823-1900).

MAX MÜLLER was one of the most celebrated philologists of the nineteenth century. After studying at Leipsic, Berlin, and Paris, he went to England and in 1850 began a connection with the University of Oxford, which was followed by his most famous works as a philologist and philosopher. His lectures, 'The Science of Language,' 'Chips from a German Workshop,' and other lectures, addresses and essays on philology went far towards popularizing what had been considered a most abstruse and difficult subject. In his 'Science of Thought' and other writings of the same class, he opposed the Darwinian theory of the descent of man with an elaboration of the argument he had used in his address before the Royal Institution in 1861—the conclusion from the study of language that the power to use it rationally to express thought and transmit the experience of one generation to those succeeding it constitutes the 'Impassable Barrier between Brutes and Man.' He died at Oxford, October 28th, 1900.

THE IMPASSABLE BARRIER BETWEEN BRUTES AND MAN

(A Lecture delivered at the Royal Institution).

IN comparing man with the other animals, we need not enter here into the physiological questions whether the difference between the body of an ape and the body of a man is one of degree or of kind. However that question is settled by physiologists, we need not be afraid. If the structure of a mere worm is such as to fill the human mind with awe, if a single glimpse which we catch of the infinite wisdom displayed in the organs of the lowest creature gives us an intimation of the wisdom of its Divine Creator far transcending the powers of our conception, how are we to criticise and disparage the most highly organized creatures of His creation, creatures as wonderfully made as we ourselves? Are there not many creatures on many points more perfect even than man? Do we not envy the lion's strength, the eagle's eye, the wings of every bird? If there existed animals as perfect as man in their physical structure, nay, even more perfect, no thoughtful man would ever be

uneasy. His true superiority rests on different grounds. "I confess," Sydney Smith writes, "I feel myself so much at ease about the superiority of mankind,—I have such a marked and decided contempt for the understanding of every baboon I have ever seen,—I feel so sure that the blue ape without a tail will never rival us in poetry, painting, and music, that I see no reason whatever that justice may not be done to the few fragments of soul and tatters of understanding which they may really possess." The playfulness of Sydney Smith in handling serious and sacred subjects has, of late, been found fault with by many; but humour is a safer sign of strong convictions and perfect sanity than guarded solemnity.

With regard to our own problem, no man can doubt that certain animals possess all the physical requirements for articulate speech. There is no letter of the alphabet which a parrot will not learn to pronounce. The fact, therefore, that the parrot is without a language of its own must be explained by a difference between the mental, not between the physical, faculties of the animal and man; and it is by a comparison of the mental faculties alone, such as we find them in man and brutes, that we may hope to discover what constitutes the indispensable qualification for language, a qualification to be found in man alone, and in no other creature on earth.

I say mental faculties, and I mean to claim a large share of what we call our mental faculties for the higher animals. These animals have sensation, perception, memory, will, and intellect, only we must restrict intellect to the comparing or interlacing of single perceptions. All these points can be proved by irrefragable evidence, and that evidence has never, I believe, been summed up with greater lucidity and power than in one of the last publications of M. P. Flourens, '*De la Raison, du Génie, et de la Folie*': Paris, 1861. There are, no doubt, many people who are as much frightened at the idea that brutes have souls and are able to think, as by "the blue ape without a tail." But their fright is entirely of their own making. If people will use such words as soul or thought without making it clear to themselves and others what they mean by them, these words will slip away under their feet, and the result must be painful. If we once ask the question, Have brutes a soul? we shall never arrive at any conclusion; for soul has been so many times defined by philosophers from Aristotle down to Hegel, that it means everything and nothing. Such has been the confusion caused by the promiscuous employment of the ill-defined terms of mental philosophy that we find Descartes representing brutes as living machines, whereas Leibnitz claims for them not only souls, but immortal souls. "Next to the error of those who deny the existence of God," says

Descartes, "there is none so apt to lead weak minds from the right path of virtue, as to think that the soul of brutes is of the same nature as our own; and, consequently, that we have nothing to fear or to hope after this life, any more than flies or ants; whereas, if we know how much they differ, we understand much better that our soul is quite independent of the body, and consequently not subject to die with the body."

The spirit of these remarks is excellent, but the argument is extremely weak. It does not follow that brutes have no souls because they have no human souls. It does not follow that the souls of men are not immortal, because the souls of brutes are not immortal; nor has the major premise ever been proved by any philosopher, namely, that the souls of brutes must necessarily be destroyed and annihilated by death. Leibnitz, who has defended the immortality of the human soul with stronger arguments than even Descartes, writes: "I found at last how the souls of brutes and their sensations do not at all interfere with the immortality of human souls; on the contrary, nothing serves better to establish our natural immortality than to believe that all souls are imperishable."

Instead of entering into these perplexities, which are chiefly due to the loose employment of ill-defined terms, let us simply look at the facts. Every unprejudiced observer will admit that—

1. Brutes see, hear, taste, smell and feel; that is to say, they have five senses, just like ourselves, neither more nor less. They have both sensation and perception, a point which has been illustrated by M. Flourens by the most interesting experiments. If the roots of the optic nerve are removed, the retina in the eye of a bird ceases to be excitable, the iris is no longer movable; the animal is blind, because it has lost the organ of sensation. If, on the contrary, the cerebral lobes are removed, the eye remains pure and sound, the retina excitable, the iris movable. The eye is preserved, yet the animal cannot see, because it has lost the organ of perception.

2. Brutes have sensations of pleasure and pain. A dog that is beaten behaves exactly like a child that is chastised, and a dog that is fed and fondled exhibits the same signs of satisfaction as a boy under the same circumstances. We can only judge from signs, and if they are to be trusted in the case of children, they must be trusted likewise in the case of brutes.

3. Brutes do not forget, or, as philosophers would say, brutes have memory. They know their masters, they know their home; they evince joy on recognizing those who have been kind to them, and they bear malice for years to those by whom they have been insulted or ill-treated. Who does not recollect the dog Argos in the 'Odyssey,' who, after so many years' absence, was the first to recognize Ulysses?

4. Brutes are able to compare and distinguish. A parrot will take up a nut, and throw it down again, without attempting to crack it. He has found that it is light: this he could discover only by comparing the weight of the good nuts with that of the bad; and he has found that it has no kernel: this he could only discover by what philosophers would dignify with the grand title of a syllogism, namely, "all light nuts are hollow; this is a light nut, therefore this nut is hollow."

5. Brutes have a will of their own. I appeal to anyone who has ever ridden a restive horse.

6. Brutes show signs of shame and pride. Here again any one who has to deal with dogs, who has watched a retriever with sparkling eyes placing a partridge at his master's feet, or a hound slinking away with his tail between his legs from the huntsman's call, will agree that these signs admit of but one interpretation. The difficulty begins when we use philosophical language, when we claim for brutes a moral sense, a conscience, a power of distinguishing good and evil; and, as we gain nothing by these scholastic terms, it is better to avoid them altogether.

7. Brutes show signs of love and hatred. There are well-authenticated stories of dogs following their masters to the grave, and refusing food from anyone. Nor is there any doubt that brutes will watch their opportunity till they revenge themselves on those whom they dislike.

If, with all these facts before us, we deny that brutes have sensation, perception, memory, will, and intellect, we ought to bring forward powerful arguments for interpreting the signs which we observe in brutes so differently from those which we observe in man.

Some philosophers imagine they have explained everything, if they ascribe to brutes instinct instead of intellect. But, if we take these two words in their usual acceptations, they surely do not exclude each other. There are instincts in man as well as in brutes. A child takes his mother's breast by instinct; the spider weaves its net by instinct; the bee builds her cell by instinct. No one would ascribe to the child a knowledge of physiology because it employs the exact muscles which are required for sucking; nor shall we claim for the spider a knowledge of mechanics, or for the bee an acquaintance with geometry, because we could not do what they do without a study of these sciences. But what if we tear a spider's web, and see the spider examining the mischief that is done, and either giving up his work in despair, or endeavouring to mend it as well as may be? Surely here we have the instinct of weaving controlled by observation, by comparison, by reflection, by judgment. Instinct, whether mechanical or moral, is more prominent in brutes than in man; but it exists in both, as much as intellect is shared by both.

Where, then, is the difference between brute and man? What is it that man can do, and of which we find no signs, no rudiments in the whole brute world? I answer without hesitation: The one great barrier between the brute and man is language. Man speaks, and no brute has ever uttered a word. Language is our Rubicon, and no brute will dare to cross it. This is our matter-of-fact answer to those who speak of development, who think they discover the rudiments at least of all human faculties in apes, and who would fain keep open the possibility that man is only a more favoured beast, the triumphant conqueror in the primeval struggle of life. Language is something more palpable than a fold of the brain, or an angle of the skull. It admits of no cavilling, and no process of natural selection will ever distil significant words out of the notes of birds or the cries of beasts.

Language, however, is the only outward sign. We may point to it in our arguments, we may challenge our opponent to produce anything approaching to it from the whole brute world. But if this were all, if the art of employing articulate sounds for the purpose of communicating impressions were the only thing by which we could assert our superiority over the brute creation, we might not unreasonably feel somewhat uneasy at having the gorilla so close on our heels.

It cannot be denied that brutes, though they do not use articulate sounds for that purpose, have, nevertheless, means of their own for communicating with each other. When a whale is struck, the whole shoal, though widely dispersed, are instantly made aware of the presence of an enemy; and when the grave-digger beetle finds the carcass of a mole, he hastens to communicate the discovery to his fellows, and soon returns with his four confederates. It is evident, too, that dogs, though they do not speak, possess the power of understanding much that is said to them,—their names and the calls of their masters; and other animals, such as the parrot, can pronounce every articulate sound. Hence, although for the purpose of philosophical warfare, articulate language would still form an impregnable position, yet it is but natural that for our own satisfaction we should try to find out in what the strength of our position really consists; or, in other words, that we should try to discover that inward power of which language is the outward sign and manifestation.

For this purpose it will be best to examine the opinions of those who approached our problem from another point; who, instead of looking for outward and palpable signs of difference between brute and man, inquired into the inward mental faculties, and tried to determine the point where man transcends the barriers of the brute intellect. That point, if truly determined, ought to coincide with the starting point.

of language ; and, if so, that coincidence ought to explain the problem which occupies us at present.

I shall read an extract from Locke's ' Essay Concerning Human Understanding.'

After having explained how universal ideas are made, how the mind, having observed the same colour in chalk, and snow, and milk, comprehends these single perceptions under the general conception of whiteness, Locke continues : " If it may be doubted whether beasts compound and enlarge their ideas that way to any degree, this, I think, I may be positive in, that the power of abstracting is not at all in them ; and that the having of general ideas is that which puts a perfect distinction betwixt man and brutes, and is an excellency which the faculties of brutes do by no means attain to."

If Locke is right in considering 'the having general ideas as the distinguishing feature between man and brutes, and, if we ourselves are right in pointing to language as the one palpable distinction between the two, it would seem to follow that language is the outward sign and realization of that inward faculty which is called the faculty of abstraction, but which is better known to us by the homely name of reason.

BENITO MUSSOLINI

(1883-).

SIGNOR MUSSOLINI, Prime Minister, or rather Dictator, of Italy, is chief among the European leaders of the reaction after the War.

He was formerly the editor of a Milan newspaper, the "Popolo d'Italia," and together with some colleagues founded the Fascisti movement to counteract Bolshevism which was very prevalent at the time in Italy. At the General Election of 1922 he and other leaders of the new party won many seats in the Chamber of Deputies, and Signor Mussolini was elected Premier. He is now not only Premier, but Minister of Foreign Affairs, Minister of War, Minister of Marine and Minister of Aeronautics as well.

It has not been pretended that he gained power by legal democratic methods, or that he has ruled with complete justice or unqualified success. Nor has he hesitated to make abrupt changes of front at convenient moments. A Socialist and revolutionary before the War, he had become by 1919 a violent patriot and opponent of Socialism and the declared saviour of Italy from a Bolshevist revolution. To-day his administration is what in England would be called conservative.

For a time he worked with Gabriele D'Annunzio, until the Treaty of Rapallo in the autumn of 1920 saw the retirement of the poet from active politics. Mussolini succeeded him as the virtual leader of the new Italy. As Premier, his administration has been remarkably vigorous, almost ruthless; efficient in a dangerously destructive way; but it has also been stained by such crimes as the assassination of Signor Matteotti, and by the persecution of the parties of the Opposition who have retired temporarily to the Aventine.

Undoubtedly the chief cause of Mussolini's rise has been the unscrupulous use of force, and it is this feature which has marred an otherwise excellent statesmanship. A typical example of what Fascismo actually means in practice is to be found in the recent disgraceful riots at Florence, where the Fascists attacked the Freemasons. Several houses were burnt, some Socialists were killed, and others were wounded or beaten. It is in the same city that one may see plaques put up on the walls to the memory of one or two dead Fascists. But

there is no mention of the hundreds of Socialists whose murder accompanied the death of these few Patriots.

Recent events lead one to believe that the Dictator is tightening up his arbitrary rule, and the explanation is probably that he plunges deeper because he cannot now go back to a more liberal form of government. For 'liberal' his administration cannot be called, when toleration, and even civic liberty, is accorded only to those of his own party.

Yet it must be admitted that Italy is passing through an heroic period. The national energy that Mussolini has liberated throughout Italy is enormous. Reforms are being effected and not merely spoken of, and the country is being thoroughly organized, perhaps for a future worthy of her venerable tradition.

If Italy survives the purgation of Fascismo and attains unity and greatness as a nation under a stable monarchy it will be due to the political genius of Signor Mussolini.

TO ROME !

(Delivered at Naples).

FASCISTI and citizens ! It may be, or rather it is almost certain, that my eloquence will disappoint you, accustomed as you are to the impetuosity and rich imagery of your own orators. But since I realise my incapacity for rhetoric, I have decided to limit myself, when speaking, to plain necessity.

We have gathered together here at Naples from every part of Italy to perform an act of brotherhood and love. We have with us our brothers from the borderland of betrayed Dalmatia, men who do not mean to yield. There are also the Fascisti from Trieste, Istria and Venezia Tridentina, Fascisti from all parts of Northern Italy, even from the islands, from Sicily and Sardinia, all come together to affirm quietly and positively the indestructibility of our united faith, which means to oppose strongly every more or less masked attempt at autonomy or separatism.

Four years ago the Italian infantry, made great through twenty years of work and hardship, the Italian infantry in which the sons of your country were so largely represented, burst from the Piave and, having defeated the Austrians, surged on towards the Isonzo, and only the foolish democratic conception of the war prevented our victorious

battalions from marching through the streets of Vienna and the highways of Budapest.

A year ago at Rome, at one time, we found ourselves surrounded by a secret hostility, which had its origin in the misunderstandings and infamies characteristic of the uncertain political world of the capital. We have not forgotten all this.

To-day we are happy that all Naples—this city which I call the big safety-reserve of the nation—welcomes us with a sincere and frank enthusiasm, which does our hearts good, both as men and Italians. For this reason I request that not the smallest incident of any kind shall disturb this meeting, for that would be a mistake, and a foolish one. I demand also, as soon as the meeting is over, that every Fascista not belonging to Naples shall leave the town immediately.

All Italy is watching this meeting, because—and let me say this without false modesty—there is not a post-war phenomenon of greater interest and originality in Europe or the world than Italian Fascismo.

You certainly cannot expect from me what is usually called a big speech. I made one at Udine, another at Cremona, a third at Milan, and I am almost ashamed to speak again. But in view of the extremely grave situation in which we find ourselves to-day, I consider this an appropriate opportunity to establish the different points of the problem in order that individual responsibilities may be settled. The moment has arrived, in fact, when the arrow must leave the bow, or the cord, too far stretched, will break.

You remember that my friend Lupi and I placed before the Chamber the alternatives of this dilemma, which is not only Fascista but also national; that is to say, legality or illegality; Parliamentary conquest or revolution. By which means is Fascismo to become the State? For we wish to become the State! Well! By 3rd October I had already settled the question.

When I ask for the elections, when I ask that they shall take place soon, and be regulated by a reformed electoral law, it is clear to everyone that I have chosen my path. The very urgency of my request shows that the tension of my spirit has arrived at breaking point. To have, or not to have, understood this means to hold, or not to hold, the key to the solution of the whole Italian political crisis.

The request came from me; but it also came from a party consisting of a formidably organised mass, which includes the rising generations in Italy and all the best, physically and morally, of the youth of the country; and from a party, too, which had a tremendous following among the vague and unstable public.

But, gentlemen, there is more. This request was made upon the morrow of the incidents of Bolzano and Trento, which had made plain to all eyes the complete paralysis of the Italian State, and revealed, at the same time, the no less complete efficiency of the Fascista State.

Well! In spite of all this, the inadequate Government at Rome puts the question on the footing of public safety and public order!

The whole question has been approached in a fatally mistaken manner. Politicians ask what we want. We are not people who beat about the bush. We speak clearly. We do good to those who do good to us, and evil to those who do evil. What do we want, Fascisti? We have answered quite simply: the dissolution of the present Chamber, electoral reform, and elections within a short time from now. We have demanded that the State shall abandon the ridiculous neutral position that it occupies between the national and the anti-national forces. We have asked for severe financial measures and the postponement of the evacuation of the third Dalmatic zone; we have asked for five portfolios as well as for the Commission of Aviation. We have, in fact, asked for the Ministry of Foreign Affairs, the War Office, the Admiralty, the Ministries of Labour and of Public Works. I am sure none of you will find our requests excessive. But to complete the picture, I will add that I shall not take part with the Government in this legal solution of the problem, and the reason is obvious when you remember that to keep Fascismo still under my control I must of necessity have an unrestricted sphere of action both for journalistic and polemic purposes.

And what has been the Government's reply? Nothing! No; worse than that, it has given a ridiculous answer. In spite of everything, not one of the politicians has known how to pass the threshold of Montecitorio in order to look the problem of the country in the face. A miserable calculation of our strength has been made; there has been talk of Ministers without portfolios, as if this, after the more or less miserable experiences of the war, was not the culmination of human and political absurdity. There has been talk of sub-portfolios, too; but that is simply laughable! We Fascisti do not intend to arrive at government by the window; we do not intend to give up this magnificent spiritual birthright for a miserable mess of ministerial pottage. Because we have what might be called the historical vision of the question as opposed to the merely political and Parliamentary view.

It is not a question of patching together a Government with a certain amount of life, but of including in the Liberal State—which has accomplished a considerable task which we shall not forget—all the forces of the rising generation of Italians which issued victorious from

the war. This is essential to the welfare of the State, and not of the State only, but to the history of the nation. And then . . . !

Then, gentlemen, the question, not being understood within its historical limits, asserts itself and becomes a question of strength. As a matter of fact, at turning-points of history force always decides when it is a question of opposing interests and ideas. This is why we have gathered, firmly organised and strongly disciplined our legions, because thus, if the question must be settled by a recourse to force, we shall win. We are worthy of it. It is the right and duty of the Italian people to liberate their political and spiritual life from the parasitic incrustation of the past, which cannot be prolonged indefinitely in the present, as it would mean the death of the future.

It is then quite natural that the Government at Rome should try to divert and counteract the movement ; that it should try to break up the Fascista organisation, and to surround us with problems.

These problems have the names of the Monarchy, the Army and Pacification.

I have already said that the discussion, abstract or concrete, of the good and evil of the monarchy as an institution is perfectly absurd. Every people in every epoch of history, given the time, place and condition necessary, has had its régime. There is no doubt that the unity of Italy is soundly based upon the House of Savoy. There is equally no doubt that the Italian Monarchy, both by reason of its origin, development and history, cannot put itself in opposition to the new national forces. It did not manifest any opposition upon the occasion of the concession of the Charter, nor when the Italian people—who, even if they were a minority, were a determined and intelligent minority—asked and obtained their country's participation in the war. Would it then have reason to be in opposition to-day, when Fascismo does not intend to attack the régime, but rather to free it from all those super-structures that over-shadow its historical position and limit the expansion of our national spirit ? Our enemies in vain try to keep this alleged misunderstanding alive.

The Parliament, gentlemen, and all the paraphernalia of Democracy have nothing in common with the monarchy. Not only this, but neither do we want to take away the people's toy—the Parliament. We say "toy" because a great part of the people seem to think of it in this way. Can you tell me else why, out of eleven millions of voters, six millions do not trouble themselves to vote ? It might be, however, that if to-morrow you took their "toy" away from them, they would be aggrieved. But we will not take it away. After all, it is our

mentality and our methods that distinguish us from Democracy. Democracy thinks that principles are unchangeable when they can be applied at any time or in any place and situation.

We do not believe that history repeats itself, that it follows a given path ; that after Democracy must come super-Democracy. If Democracy had its uses and served the nation in the nineteenth century, it may be that some other political form would be best for the welfare of the nation in the twentieth. So that not even fear of our anti-Democratic policy can influence the decision in favour of that continuity of which I spoke just now.

As regards the other institution in which the régime is personified—the army—the army knows that when the Ministry advised the officers to go about in civilian clothes to escape attack, we, then a mere handful of bold spirits, forbade it. We have created our ideal. It is faith and ardent love. It is not necessary for it to be brought into the sphere of reality. It is reality in so far as it is a stimulus for faith, hope and courage. Our ideal is the nation. Our ideal is the greatness of the nation, and we subordinate all the rest to this.

For us the nation has a soul and does not consist only in so much territory. There are nations that have had immense possessions and have left no trace in the history of humanity in spite of them. It is not only size that counts, because, on the other hand, there have been tiny, microscopic States that have left indelible marks in the history of art and philosophy. The greatness of a nation lies in the aggregation of all these virtues and all these conditions. A nation is great when its spiritual force is transferred into reality. Rome was great when, from her small rural democracy, little by little, her influence spread over the whole of Italy. Then she met the warriors of Carthage and fought them. It was one of the first wars in history. Then, bit by bit, she extended the dominion of the Eagle to the furthestmost boundaries of the known world, but still, as ever, the Roman Empire is a creation of the spirit, as it was the spirit which first inspired the Roman legions to fight.

What we want now is the greatness of the nation, both materially and spiritually. That is why we have become syndicalist, and not because we think that the masses by reason of their number can create in history something which will last. These myths of the lower kind of Socialist literature we reject. But the working people form a part of the nation ; and they are a great part of the nation, necessary to its existence both in peace and in war. They neither can nor ought to be repulsed. They can and must be educated and their legitimate

interests protected. We ask them : " Do you wish this state of civil war to continue to disturb the country ? " No ! For we are the first to suffer from the ceaseless Sunday wrangling with its lists of dead and wounded. I was the first to try to bridge over the gap which exists between us and what is called the Italian Bolshevist world.

To prove this, I have just recently signed an agreement most gladly ; in the first place because it was Gabriele d'Annunzio who asked me to, and in the second place because it was, as I thought, another step towards a national peace.

But we are no hysterical women who continually worry themselves by thinking of what might happen. We have not the catastrophic, apocalyptic view of history. The financial problem which is so much talked about is a question of will-power. Millions and millions would be saved if there were men in the Government who had the courage to say " No " to the different requests. But until the financial question is brought on to a political basis it will not be solved. We are all for pacification, and we should like to see all Italians find the common ground upon which it is possible for them to live together in a civilised way. But, on the other hand, we cannot give up our rights and the interests and the future of the nation for the sake of measures of pacification that we propose with loyalty but which are not accepted in the same spirit by the other side. We are at peace with those who ask for peace, but for those who ensnare us and, above all, ensnare the nation, there can be no peace until after victory.

And now, Fascisti and citizens of Naples, I thank you for the attention with which you have listened to me.

Naples gives a fine display of strength, discipline and austerity. It was a happy idea that led to our coming here from all parts of Italy, that has allowed us to see you as you are, to see your people who face the struggle for life like Romans, and who, with the desire to rebuild their lives and to gain wealth through hard work, carry ever in their hearts the love of this their wonderful town, which is destined to a great future, especially if Fascismo does not deviate from its path.

Nor must the Democrats say that there is no need for Fascismo here, as there has been no Bolshevism, for here there are other political movements no less dangerous than Bolshevism and no less likely to hinder the development of the public conscience.

I already see the Naples of the future endowed with an even greater splendour as the metropolis of the Mediterranean ; and I see it together with Bari (which in 1805 had sixteen thousand inhabitants and now has one hundred and fifty thousand) and Palermo forming a powerful

triangle. And I see Fascismo concentrating all these energies, purifying certain circles, and removing certain members of society, gathering others under its standards.

And now, members of the Fascio of all Italy, lift up your flags and salute Naples, the capital of Southern Italy and the Queen of the Mediterranean.

THE DAWNING OF NEW ITALY

(Delivered at Milan).

I AGREED to come and speak to the "Sciesa" group this evening for three reasons—first sentimental, second personal, and third political.

For the sentimental reason, because I wished to pay the tribute of my admiration and profound devotion to our unforgettable and magnificent fallen—Melloni, Tonoli and Crespi; the first two of your squad and the last of the "Sauro." I remember them perfectly. Then I agreed also because of the way in which this group interpreted this meeting. Lastly, in view of the general attitude of suspense all over Italy at this moment, I did not wish to let the opportunity slip for defining certain points, a definition which is necessary in these difficult times through which we are passing.

You feel, to judge from your silent and austere bearing, that if the flesh is corruptible, the spirit is immortal. You feel that here in this little hall this evening the spirits of our fallen are still with us. We feel their presence, because the soul cannot die, and they fell in the most heroic action yet accomplished by Fascismo in the four years of its history. Many times when the Fascisti have gone forth to destroy with fire and sword the haunts of the cowardly Social-Communist delinquents, they have only seen the backs of the flying enemy, but the members of the "Sciesa" squad and the two fallen, whom we remember, and all the squadrons of the Milanese Fascio, went to the assault of the offices of the Avanti as they would have attacked an Austrian trench. They had to scale the walls, break through barbed wire, burst open doors and face the leaden hail which the enemy poured forth from their weapons. This is heroism. This is violence. This is the violence of which I approve and which I uphold, and which Fascismo—and I speak to the Fascisti of all Italy—ought to make hers. Not little, individual, sporadic acts of violence, but the great, wonderful, relentless violence of the decisive hour. It is necessary, when the moment comes, to strike with the utmost decision and without pity. You must not think that I

wish to hide the very strong sympathy I have for the Milanese Fascio, because my love, above all, is for the cause. When a cause has been sanctified by so much pure young blood, it must not, at any cost, become defiled in any way. Our friends have been heroes, their action has been that of warriors, their violence saintly and moral. We exalt them, we remember them, and we will avenge them. We cannot accept the humanitarian, Tolstoyan moral standard, the moral standard of slavery. In times of war we adopt the formula of Socrates: "Overcome friends with kindness, overcome enemies with evil."

Our line of conduct is perfectly correct. Those who do good to us will have good; those who do ill, ill. Our enemies cannot complain, if being such, they are treated hardly, as enemies must be treated. We are in an historical period of crisis which every day becomes more acute. The general strike, which was averted by the sacrifice of blood of the Fascisti, was an episode in this crisis. Dissension lies between the State and the nation. Italy is not a State, she is a nation, because from the Alps to Sicily there is the fundamental unity of our race, our customs, our language and our religion. The war fought from 1915 to 1918 consecrates this unity, and if this is enough to characterise the nation, the Italian nation exists, full of power and resource and impelled towards a glorious destiny.

But the nation must create for itself the State. And there is no State. To-day the paper which represents Liberalism in Italy, the paper with the largest circulation—and which, for this reason, by upholding absurd arguments has done a great deal of harm at times—stated that there are two Governments in Italy, and if there are two, there is one too many. There is the Liberal Government and the Fascista Government; the State of to-day and the State of to-morrow. "Wanted, a Government," said the *Corriere della Sera*. We agree, a Government is wanted.

Two occurrences during these last days—one characteristic of our activity in the cause of humanity, the other of our activity in the cause of national rights—have proved the superiority of the Fascista over the Liberal State, and have shown that Fascismo is capable and worthy to succeed that State.

At San Terenzo of Spezia, if all the dead were buried and the wounded taken to the hospital, if the country was cleared of debris, and the furniture and belongings safeguarded from the base attempts of human jackals, if the soldiers had their supplies in good time, it was by the activity of the Fascista State. And the mayor of Lerici—who is not a Fascista—telegraphed his great gratitude, not to the Prime Minister, but to us, as you learnt in the *Popolo d'Italia*.

This is a question of mercy, humanity and national solidarity. Let us transfer our attention to Bolzano. Here it is a question of our rights and the Italian law. Who stood up for those rights and imposed the Italian nationality in a city which ought to be Italian? Fascismo. Who banished Perathoner who for five years held in check five Italian Ministers? Fascismo. It has been Fascismo that has given a school and a church to the Italians in the Upper Adige and inspired them with the sense of their own dignity. Who placed the bust of the king in the Council Hall? The Fascisti. The Germans are astonished at seeing before them all these young Fascisti, splendid physically and morally. Inhabiting as they do without right our Italian soil, they seem to wonder: "What Italy is this?" And we answer: "By the action of the defeatist ministers and as a result of the unfortunate peace, you Germans are accustomed to the Italy of Abba Garima; now you must accustom yourselves to the Italy of Vittorio Veneto, which has force and energy, and which says: 'We are at the Brenner, and there we mean to stay! We do not wish to go to Innsbruck, but do not imagine that Germany and Austria can ever return to Bolzano!'"

This is the Fascista State which reveals itself to Italian eyes in two typical moments of everyday history, the disaster of San Terenzo and the occupation of Bolzano.

The citizens wonder which State will end by dictating its law upon the nation. We have no hesitation in answering that it will be the Fascista State. The *Corriere della Sera* says that something must be done quickly, and we agree. A nation cannot live nursing in its bosom two States, two Governments, one in action and the other in power. But what is the way to give the nation a Government? I say Government, because when we say State we mean something more. We mean the spirit and not merely the inert and transitory form. There are two ways, gentlemen. If the whole of Rome was not suffering from softening of the brain, they would summon Parliament at the beginning of November, and having passed the Bill for Electoral Reform, make an appeal to the electors in December. Because the crisis for which the *Corriere* asks could not alter the situation. Thirty crises in the Italian Parliament as it is to-day would mean thirty reincarnations of Signor Facta. If the Government does not follow this path, gentlemen, we shall be obliged to take the other. You see our tactics are now clear. When it is a question of assaulting the State it is no longer possible to have recourse to little plots, of which the "to be or not to be" remains a secret to the last. We must give orders to hundreds and thousands of men, and it would be merely absurd to try to keep it secret. We play an open game. We leave our cards on the table until it is necessary

to lift them : and we say : " There is an Italy which you Liberal leaders no longer understand. You do not understand it because Parliamentary policy has killed your spirit. The Italy which has come from the trenches is strong, and full of life."

It is an Italy which deserves to begin a new period of history. There exists, therefore, a dramatic contrast between the Italy of yesterday and our Italy. The conflict appears inevitable. It is a question now of developing our forces, summoning all our energies and strength, so that the conflict shall end in victory for us—and, as a matter of fact, upon that score there can be no doubt.

Now the Liberal State is a mask behind which there is no face, it is a scaffolding behind which there is no building. There is force but there is no spirit behind it. All those who ought to uphold it feel that it is approaching the extreme limits of incompetence, impotence and absurdity.

On the other hand, as I said at Udine, we do not wish to stake everything on the game, because we do not present ourselves as the saviours of humanity, nor do we promise anything special to the people. We may even impose greater discipline and more sacrifices upon them. And we shall make no difference between the proletariat and the bourgeoisie, because there is an infected proletariat just as there is a bourgeoisie still more infected. There is a part of the proletariat that must be chastised in order that it may be redeemed afterwards, and there is a part of the middle class which detests us and tries to throw our lines into confusion, which finances anti-Fascista slander, which has hitherto ignobly courted the anti-national forces, and for which I do not feel one ounce of pity. We are surrounded by enemies, and those who are our open foes, and who belong to the Bolshevist parties, have now perfected themselves in the art of ambush and assassination.

But there are other insidious enemies who try to harm Fascismo under cover of the tricolour and other similar emblems, who try to insinuate themselves into our movement and to create simulacra of organisations in order to weaken us just at the time when it is most necessary for us to remain united. Now I must say that if we do not have mercy upon those who attack us from behind hedges, neither shall we have mercy upon those who attack us thus insidiously. When the clock of history strikes the hours, we must speak as the peasants do, simply, sincerely and loyally.

We have no great obstacles to overcome, as the nation is waiting for us, the nation hopes in us and feels itself represented in us. Certainly we cannot promise to plant the tree of liberty in the squares. We cannot give liberty to those who would profit by it to assassinate us.

The shortsightedness of the Free State lies in this, that it gives freedom to all, including those who use this freedom to overthrow it. We shall not give this universal liberty, not even if it assumes the garb of immortal principles. Finally, it is not electoral subterfuges which divide us from Democracy. If people wish to vote, let them vote. Let us all vote until we are sick of it! Nobody wants to suppress universal suffrage.

But we shall carry out a severe and reactionary policy; we are not afraid of doing so. If the representative organs of Democracy say that we are reactionary it does not offend us, because what distinguishes us from the Democrats is mentality and spirit. History does not follow a given itinerary; it is made up of contrasts and all kinds of vicissitudes, there are no centuries which are all light and no centuries which are all darkness. It is not possible to transport Fascismo out of Italy, as Bolshevism has been transported out of Russia.

The Italians can be divided into three categories: the indifferent, who will stay at home; the sympathetic, who will have freedom of movement; and the antagonistic, who will have their freedom restricted. We shall make no promises. We shall not give ourselves out as missionaries who bring the revealed truth.

But I do not think that our enemies will place serious obstacles in our way. Bolshevism is defeated. Look at the Congress of Rome. What a pitiful sight! When the leader of a congress behaves like the lawyer of Busto, then you understand that we are upon the bottom rung of the ladder. There was one Socialism, to-day there are four, and there is a tendency towards further divisions. And not only this, but each of these divisions claims to represent the authentic party. It is no wonder that the proletariat scatters, discouraged and disgusted by the attitude of Socialism. As I have already said, the day of Socialism is not only past as a party, its philosophies and doctrines no longer stand. The Italians and the Western peoples in general must burst with logical criticism the grotesque bubble of international Socialism. Perhaps, looking at things from an historical point of view, it is a struggle between the East and the West, between the chaotic, fatalistic East (look at Russia) and us, we people of the West, who cannot be carried away by flights of metaphysics and require hard concrete realities.

Italians cannot be mystified for long by Asiatic doctrines, which are absurd and criminal in their practical application. This is the essence of Italian Fascismo, which represents a reaction against the Democrats who would have made everything mediocre and uniform and tried every way to conceal and to render transitory the authority of the

State, from the supreme head to the last usher in the law courts ; consequently everybody from the King to the lowest official has suffered from this false conception of life. Democracy thought to make itself indispensable to the masses, and did not understand that the masses despise those who have not the courage to be what they ought to be. Democracy has taken "elegance" from the lives of the people, but Fascismo brings it back ; that is to say, it brings back colour, force, picturesqueness, the unexpected, mysticism, and in fact all that counts in the souls of the multitude. We play upon every cord of the lyre, from violence to religion, from art to politics. We are politicians and we are warriors. We are syndicalists and we also fight battles in the streets and the squares. That is Fascismo as it was conceived at Milan, and as it was and is realised. And, my friends, we must maintain this privilege, and Fascismo must be kept up to this level of strength and wisdom. We must not abandon ourselves to imitations, because that which is possible in a particular agricultural region in a given time and place is not possible here in Milan. Here the situation has been dominated more by the spontaneous maturing of events than by men's violence or by circumstances. Here our domination becomes more and more decided.

But, my friends, we must prepare ourselves with hearts free from preoccupation for the tasks which await us. To-morrow it is probable, almost certain, that the formidable burden of the direction of a modern State will be on our shoulders. And it will be on the shoulders not only of a few men, it will be on the shoulders of the whole of Fascismo.

And millions of eyes, many of them malicious, and millions of men, many of them beyond our frontiers, will be looking at us. They will want to see how we are organised, how justice is administered in the Fascista State, how honest people are protected, how we deal with the problems of the school and the army. And the wrong-doing of any man, his error and his shame will react upon the whole organisation of the State and of necessity upon Fascismo. Have you, my friends, realised how formidable is the task which awaits you ? Are you spiritually prepared for it ? Do you think that enthusiasm alone is enough—because it is not enough. It is necessary, because it is a primitive and fundamental force in human nature, it is impossible to do anything not inspired by intense passion or religious mysticism ; but that is not enough. Together with these must work the reasoning forces of the brain. I think that in the case of a general crisis Fascismo would have all that was necessary to impose itself and to govern, not according to the ideas of demagogism, but according to the ideas of justice. And then, by ruling the nation well, by leading her towards a more glorious

destiny, by conciliating the interests of all classes without increasing the hatred of one and the selfishness of another, by uniting the Italian people to face the world-task, by fulfilling with patience this hard and cyclopean task, we shall inaugurate, thus, a really great period in Italian history. Thus will our dead be made immortal and their names written in the gold book of the Fascista aristocracy. We shall point them out to the rising generation, to the children who are growing up and who represent the eternal spring of life. We shall say: "Great was the effort and hard the sacrifice, and pure was the blood that was shed; and it was not shed to safeguard the interests of individuals, class or caste, it was not shed in the name of materialism, it was shed in the name of an ideal, of all that is most noble, beautiful and generous in the human soul." With the example of our dead before you, I ask you to remember to be worthy of their sacrifice and to examine daily your own activity. Friends, I have faith in you. You have faith in me. In this mutual trust is the guarantee and certainty of our victory. Long live Italy! Long live Fascismo! Honour and glory to the martyrs of our cause!

SIR WILLIAM OSLER

M.D., F.R.S.

(1851-1919).

WILLIAM OSLER was born in Canada in 1851, and had a brilliant medical career there and in the United States. In 1905 he became Regius Professor of Medicine at Oxford University, where his rare distinction of character and accomplishments made all Oxford men proud of him.

He brought from the New World a frank and open mind and a total freedom from the heavy bonds of custom and convention. It is recorded as characteristic of Osler's love for his work that when spending a few weeks' leave in Paris he attended the clinics at the great hospitals at 7.30 a.m. with the young students.

His great text-book on physiology is a classic, and his literary essays, *e.g.*, "Aequanimitas," are both vivid and telling in a high degree.

Osler was caught by the "lightning" railway strike and stranded at Newcastle. In order to meet important engagements he motored in an open car to Oxford, contracting an illness from which he died on December 29th, 1919. A "strike" thus brought about the loss of one of the Empire's greatest men and a notable benefactor of his kind.

SCIENCE, WAR AND PEACE

(Delivered at Leeds, 1915).

IN Time our civilisation is but a thin fringe like the layer of living polyps on the coral reef, capping the dead generations on which it rests. The lust of war is still in the blood : we cannot help it. There was, and there is as yet, no final appeal but to the ordeal of battle. Only let us get the race in its true perspective in which a thousand years are but as yesterday, and in which we are contemporaries of the Babylonians and Egyptians and all together within Plato's year. Let us remember, too, that war is a human development, unknown to other animals. Though nature is ruthless "in tooth and claw," collective war between members of the same species is not one of her weapons ; and in this sense Hobbes's dictum that "war was a state of nature" is not true. The

dinosaurs and pterodactyls and the mastodons did not perish in a struggle for existence against members of their own species, but were losers in a battle against conditions of nature which others found possible to overcome. In our own day the gradual disappearance of native populations is due as much to whisky and disease as to powder and shot, as witness in illustration of the one the North American Indian and of the other the Tasmanians.

Some of us had indulged the fond hope that in the power man had gained over nature had arisen possibilities for intellectual and social development such as to control collectively his morals and emotions, so that the nations would not learn war any more. We were foolish enough to think that where Christianity had failed science might succeed, forgetting that the hopelessness of the failure of the Gospel lay not in the message, but in its interpretation. The promised peace was for the individual—the world was to have tribulations ; and Christ expressly said : “ Think not that I am come to send peace on earth ; I came not to send peace but a sword.” The Abou ben Adhems woke daily from their dreams of peace, and lectured and published pamphlets and held congresses, while Krupp built 17-inch howitzers and the gun range of the super-Dreadnoughts increased to eighteen miles !

And we had become so polite and civil, so cultured in both senses of that horrid word, with an “ Is thy servant a dog ? ” attitude of mind in which we overlooked the fact that beneath a skin-deep civilisation were the same old elemental passions ready to burst forth.

In spite of unspeakable horrors war has been one of the master forces in the evolution of a race of beings that has taken several millions of years to reach its present position. During a brief fragment of this time—ten thousand or more years—certain communities have become civilised, as we say, without, however, losing the savage instincts ground into the very fibre of their being by long ages of conflict. Suddenly, within a few generations, man finds himself master of the forces of nature. In the fulness of time a new dispensation has come into the world. Let us see in what way it has influenced his oldest and most attractive occupation.

Science is a way of looking at the world taught us by the Greeks—a study of nature with a view of utilising her forces in the service of man. It “ arose from the simplest facts of common experience, and grew by the co-operation of the mass of men with human intellect at its highest. And when developed it returns again to strengthen the common intelligence and increase the common good. Above all, more perfectly than any other form of thought, it embodies the union of past and present in a conscious and active force.” Man’s latest acquisition, it has

worked a revolution in every aspect of his life, without so far changing in any way his nature. He is still a bit bewildered, and not quite certain whether or not the invention is a Frankenstein monster. The promise of Eden of full dominion over nature has only been fulfilled in our day. The flower and fruitage has come suddenly within a couple of generations. Even the seed time was but a few years ago, for to the Heidelberg man, looking down the ages from the Glacial period, Aristotle and Darwin are contemporaries, Galen and Lister fellow practitioners. Steam and electricity have upset our weekday relations, and the theory of evolution our Sundays. Like a beggar suddenly enriched, man has not yet found himself; and the old ways and old conditions often sort ill with the changing times. New bottles could not always be found for the new wine.

Organised knowledge, science, if living, must infiltrate every activity of human life. There was a difficulty in these islands, which of fruitful ideas, inventions, and discoveries have had the lion's share, but failed to grasp quickly their practical importance. The leaders of intellectual and political thought were not awake when the dawn appeared. The oligarchy who ruled politically were ignorant, the hierarchy who ruled intellectually were hostile. Read of the struggles at Oxford and Cambridge in the "fifties" and "sixties" of the last century to get an idea of the attitude of the intellectual leaders of the country towards "Stinks," the generic term for science. It was not port and prejudice, as in Gibbon's day, but just the hostility of pure mediæval ignorance. Those in control of education were more concerned with the issues of Tract 90 and the Colenso case than the conservation of energy and "The Origin of Species." To take but one example. What a change it might have wrought in rural England if, in 1840, when the distinguished Prof. Daubeny was made professor of rural economy, Oxford could have had great State endowment for an Agricultural College. The seed was abundant and the soil was good, and only needed the cultivation that has been given so freely by members of the past generation, with what results we see to-day at Oxford and Cambridge and in the new universities.

In two ways science is the best friend war has ever had; it has made slaughter possible on a scale never dreamt of before, and it has enormously increased man's capacity to maim and to disable his fellow-man. In exploiting the peaceful victories of Minerva, Mars has added new glories to his name. More men are killed, more men are wounded, and consequently more men are needed than ever before in the history of the world's wars. From 1790 to 1913 there were 18,552,200 men engaged in the great wars, of whom 5,498,097 lost their lives (D. E. Smith). In the Balkan wars of 1912-13 there were 1,230,000 men engaged, of whom

350,000 were killed. In the Russo-Japanese War there were 2,500,000 men, of whom 555,900 lost their lives (D. E. Smith). It is estimated that in the present war more than twenty-one millions are engaged! As weapons have improved the losses will be yet greater, and we may expect that at least five or six millions of men in the prime of life will be killed. Within a few years artillery and high explosives, submarines, and aircraft have so revolutionised our methods of warfare that thousands are now destroyed instead of hundreds. The rifle and the bayonet seem antiquated, and one may go from hospital to hospital and not a wound from the latter, and comparatively few from the former.

Let us see what science has done in a mission of salvation amid the horrors of war. Through the bitter experiences of the Napoleonic wars, of the Crimea, of the American Civil War, and more particularly of the recent campaigns, there has been evolved a wonderful machinery, replete with science, for the transport and care of the sick and wounded. There must be suffering—that is war—but let us be thankful for its reduction to a minimum, through the application in every direction of mechanical and other pain-saving devices.

If the foes of our own household, the “anti’s,” would spend a few days at a hospital for infectious diseases, see the modern methods, and learn a few elementary facts about immunity, they could not but be impressed with the applications of scientific horticulture to disease, and be lost in admiration of a technique of extraordinary simplicity and accuracy.

The second great victory of science in war is the prevention of disease. Apollo, the “far darter,” is a greater foe to man than Mars. “War slays its thousands, Peace its ten thousands.” In the Punjab alone, in twelve years, plague has killed two and a half millions of our fellow-citizens. This year two preventable diseases will destroy more people in this land than the Germans. The tubercle bacillus alone will kill more in Leeds in 1915 than the city will lose of its men in battle. Pestilence has always dogged the footsteps of war, and the saying is true—“Disease, not battle, digs the soldier’s grave.” Bacilli and bullets have been as David and Saul, and at the breath of fever whole armies have melted away, even before they have reached the field. The fates of campaigns have been decided by mosquitoes and flies. The death of a soldier from disease merits the reproach of Armstrong:—

“Her bravest sons keen for the fight have dy’d

The death of cowards and of common men—

Sunk void of wounds and fall’n without renown.”

This reproach science has wiped away. Forty years ago we did not know the cause of any of the great infections. Patient study in many lands

has unlocked their secrets. Of all the great camp diseases—plague, cholera, malaria, yellow fever, typhoid fever, typhus, and dysentery—we know the mode of transmission, and of all but yellow fever the germs. Man has now control of the most malign of nature's forces in a way never dreamt of by our fathers. A study of her laws, an observation of her facts—often of very simple facts—has put us in possession of life-saving powers nothing short of miraculous. The old experimental method, combined with the new chemistry applied to disease, has opened a glorious chapter in man's history. Half a century has done more than a hundred centuries to solve the problem of the first importance in his progress.

Lastly, in the treatment of wounds science has made great advances. The recognition by Lister of the relation of germs to suppuration, an outcome of Pasteur's work, has done away with sepsis in civil life. High explosives, shell, and shrapnel make wounds that are at once infected by the clothing and dirt, and are almost impossible to sterilise by any means at our command, but with free drainage, promotion of natural lavage from the tissues by Wright's method, and the use of antiseptics when indicated, even the most formidable injuries do well. The terrible laceration of soft parts and bones adds enormously to the difficulty of treatment. The X-ray has proved a boon for which surgery cannot be too grateful to Röntgen and to the scores of diligent workers who have given us a technique of remarkable accuracy. Other electrical means for detecting foreign bodies have also given good results.

Of the germs blown into wounds from the soil and clothing and skin the pus-formers are the most numerous and most important. Two others have proved serious foes in this war, the germ that causes gas gangrene and the tetanus bacillus. I am told that methods of treatment of wounds infected by the former are giving increasingly good results. The soil upon which the fighting has occurred in France and Flanders is rich in the spores of the tetanus bacillus; the disease caused by it was at first very common and terribly fatal among the wounded. For centuries it has been one of the most dreaded of human maladies, and justly so, as it is second to none in fatality and in the painful severity of the symptoms. No single aspect of preventative medicine has been more gratifying in this war than the practical stamping out of the disease by preventative inoculation. In the first six months of this year only thirty-six of those who were inoculated within twenty-four hours of being wounded suffered from tetanus.

And what shall be our final judgment—for or against science? War is more terrible, more devastating, more brutal in its butchery, and the organisation of the forces of nature has enabled man to wage it on a

titanic scale. More men will be engaged and more will be killed and wounded in a couple of years than in the wars of the previous century. To humanity in the gross science seems a monster, but on the other side is a great credit balance—the enormous number spared the misery of sickness, the unspeakable tortures saved by anæsthesia, the more prompt care of the wounded, the better surgical technique, the lessened time in convalescence, the whole organisation of nursing ; the wounded soldier would throw his sword into the scale for science—and he is right.

WILLIAM PEDDIE

(1861-).

WAS born at Westray, one of the Orkney Isles, in 1861. He was educated at Orkney and Edinburgh, where he took his degree as Doctor of Science in 1888, becoming F.R.S.E. and winner of the Macdugall-Brisbane medal ten years later. He was formerly lecturer on Physics at Edinburgh and is now Professor of Physics at Dundee University.

Dr. Peddie is the author of some standard monographs on physical science, among them: "A Manual of Physics," and "Dynamics of Solids and Fluids." He has edited several of the classics of science and has written largely for the scientific journals, popular encyclopædias, and other collections of knowledge and information.

THE NATURE OF SCIENTIFIC KNOWLEDGE

(An Address to University Students, Dundee).

WE come now to the question of what we are to regard as knowledge. What is the method of its attainment? What certainty have we of the truth of our knowledge? Have we to join in the wailings of the earlier Greeks that there exists no criterion; or is belief of any value to us as it was to Socrates?

Science is knowledge, and any developed body of knowledge constitutes a science whether it happens to be called by that name or not. Francis Bacon, who explicitly formulated the scientific method, made the proud boast that he had taken all knowledge as his realm. His boast was a very foolish one if it were taken literally, as he showed when he attempted to apply his own principles to astronomy, in which he was no specialist. But it was a clear visioned one if regarded, as he meant it, as a recognition that all knowledge was subject, in its acquirement, to the method which he formulated. That is simply the old inductive method as given by Aristotle. Observations, or facts, are furnished by the senses. Reason sifts them and by means of the imagination forms a general induction, or theory, which concisely connects and describes these facts. Further from that theory, Reason, if possible, predicts the existence of the other facts. By the verification of these predictions,

the theory receives confirmation and the body of knowledge to which it belongs is added to. This is the method by which all knowledge advances. The question of its accuracy still remains. I cannot do better than state the problem in the words of Algazzali, the Arabian philosopher to whom I have referred. In his own mental experience he passed through the historical stages of Grecian thought.

I said to myself, "My aim is simply to know the truth of things; consequently, it is indispensable for me to ascertain what is knowledge." Now, it was evident to me that certain knowledge must be that which explains the object to be known in such a manner that no doubt can remain, so that in future all error and conjecture respecting it must be impossible. Not only would the understanding then need no efforts to be convinced of certitude, but security against error is in such close connection with knowledge, that even were an apparent proof of falsehood to be brought forward, it would cause no doubt, because no suspicion of error would be possible. Thus, when I have acknowledged ten to be more than three, if anyone were to say, "on the contrary three is more than ten, and, to prove the truth of my assertion, I will change this rod into a serpent," my conviction of his error would remain unshaken. His manœuvre would only produce in me admiration for his ability. I should not doubt my own knowledge.

Then was I convinced that knowledge which I did not possess in this manner, and respecting which I had not this certainty, could inspire me with neither confidence nor assurance; and no knowledge without assurance deserves the name of knowledge.

Having examined the state of my own knowledge, I found it to be divested of all that could be said to have these qualities, unless perceptions of the senses and irrefragable principles were to be considered such. I then said to myself, "Now, having fallen into this despair, the only hope of acquiring incontestable convictions is by the perceptions of the senses and by necessary truths." Their evidence seemed to me to be indubitable. I began, however, to examine the objects of sensation and speculation, to see if they possibly could admit of doubt. Then doubts crowded upon me in such numbers that my incertitude became complete. If we look at the stars, they seem to be as small as money pieces; but mathematical proofs convince us that they are larger than the earth. These and other things are judged by the senses, but rejected by reason as false. I abandoned the senses, therefore, having seen all my confidence in their truth shaken.

"Perhaps," said I, "there is no assurance but in the notions of reasons, that is to say, first principles, as that ten is more than three. . . ; to exist and not to exist at the same time is impossible."

Upon this the senses replied, "What assurance have you that your confidence in reason is not of the same nature as your confidence in us? When you relied on us, reason stepped in and gave us the lie; had not reason been there, you would have continued to rely on us. Well, may there not exist some other judge superior to reason, who, if he appeared, would refute the judgments of reason in the same way that reason refuted us? The non-appearance of such a judge is no proof of his non-existence."

I strove in vain to answer the objection, and my difficulties increased when I came to reflect on sleep. I said to myself "During sleep, you give to visions a reality and consistence, and you have no suspicion of their untruth. On awakening, you are made aware that they were nothing but visions. What assurance have you that all that you feel and know when you are awake does actually exist? It is all true as respects your condition at that moment; but it is nevertheless possible that another condition should present itself which should be to your awakened state that which your awakened state is now to sleep; so that as respects this higher condition, your waking is but sleep."

Finally, Algazzali concludes that the first stage in life is that of pure sensation: the second is that of understanding; "the third is that of reason, by means of which the intellect perceives the necessary, the possible, the absolute, and all those higher subjects which transcend the understanding. But after this there is a fourth stage, when another eye is opened, by which man perceives things hidden from others, perceives all that will be, perceives the things that escape the perceptions of reason, as the objects of reason escape the understanding, and as the objects of the understanding escapes the sensitive faculty. This is prophetism."

The last word need not surprise us if we consider what its essential meaning must be. We would now use some such term as "intuitive genius" instead. To prophesy is to make an assertion for another feeling it to be true or fit. It is the gift of genius to make such assertions. Algazzali's "eye of prophetism" is simply a sense of fitness. He has arrived at the conclusion of Socrates that, if sure proof cannot be found, belief in what is best is always possible. That is the position of modern science. It aims at a simple comprehensive, accurate description; and it adopts the fittest. To one who has not considered the matter, it may seem astounding to be told that science is based upon belief, but a little reflection will make it clear. The conclusions of mathematics, the most rigid of the supposed rigid sciences, are no more certain than the postulates upon which they are based. Grant the postulates and the conclusions are infallible. The postulates of Euclid, which are the

beliefs of ordinary geometry, cannot be verified, in their applicability to our universe, as being free from an error of about one in ten millions.

It is not possible for us to draw, in this world, any conclusion which does not test us. And it is better so, for we may say with Rabbi ben Ezra :—

“ Do I remonstrate : folly wide the mark !
 Rather I prize the doubt
 Low kinds exist without,
 Finished and finite clods, untroubled by a spark.”

We have seen there is no distinction to be drawn, as to its ultimate nature and method of acquirement or development, between knowledge in any branch of thought and knowledge which is usually called scientific. Therefore a consideration of the subject with which we have been dealing in this light sketch may be of equal value to each one of you, whatever be your special line of study. I have brought it before your notice in the hope that this may be so. To those of you who are students of education, which is the science of progress of knowledge in all branches, the subject is one of fundamental importance, as it is also to those who are students of science in any one of its branches. To those of you who are students of literature and related subjects, the importance of the scientific method may not seem to be direct in its relations to your studies. What has the scientific method to do with the writing of an epic poem ? The answer is much, unconsciously. The best poetry contains concise, accurate, and intuitively imaginative descriptions of facts, thoughts, or emotions, couched in language which obeys certain rules of form. There is a science of language, and the best science itself is concise, accurate, and intuitively imaginative description. So also, the truest history is a science of events and their relations. Further, I would remind those of you who aim at attainments in various directions of practice that, other things being equal, the best practitioner is the one who understands from the widest point of view. And to any of you who may intend subsequently to undertake studies in theology, I would point out a saying of Wyclif which should merit your reverence—“ God bindeth not men to believe anything they cannot understand ” : also this, that in founding the doctrines you teach upon fit beliefs, you are taking the same ground as science takes in her progress. She can cast no sneer at theology. The common ground of the two is their joint glory.

Each one of you must take part in the progress of knowledge ; not personal knowledge merely, but the total of human knowledge. This is a duty which no one can avoid. What then about failure ?

If you wish a definition of it, take this : " A man's reach must exceed grasp." This means that aim must go beyond attainment. But that is also a definition of success. The climber reaches high in his search for holds ; but in order to ascend surely, he chooses the holds which are well within his power, and he often tries wrong paths before he finds the right one. A world in which there was no failure would be an imperfect world. You remember the dweller in the star Rephan, the home of perfection, where there was

" No hope, no fear : as to-day, shall be
To-morrow : advance or retreat need we
At our stand still through eternity ! "

He asks

" How did it come to pass there lurked
Somehow a seed of change that worked
Obscure in my heart till perfection irked—"

At last a voice said to him

" Thou are past Rephan, thy place be Earth."

You remember also the grammarian whose life was spent in the search for knowledge.

" That low man seeks a little thing to do,
Sees it and does it :
This high man with a great thing to pursue,
Dies ere he knows it.
That low man goes on adding one to one,
His hundred's soon hit :
This high man, aiming at a million,
Misses an unit.
That has the world—should he need the next
Let the world mind him !
This throws himself on God, and unperplexed
Seeking shall find Him."

So men buried the grammarian high on the mountain top ; for they recognised that

" Lofty designs must close in like effects !
Loftily lying,
Leave him—still loftier than the world suspects,
Living and dying."

They recognized that he had sought knowledge for its own sake.
You also may do this.

JOHN PERRY

(1850-1921).

MATHEMATICIAN, engineer, and educational reformer, an Ulster man, born 1850. He was educated at Queen's College, Belfast, where he graduated at the age of twenty. The next four years (1870-74) he spent as an assistant master at Clifton College. In 1875 he went to Japan as a Professor of Engineering, remaining there for five years. Returning to England he spent a long period in research and invention in electrical engineering and physics generally (1880-96). He continued to teach mathematics and engineering in London during this time, and latterly^y became Professor of Mechanics at the Royal College of Science, Kensington.

He won various degrees and honours, among others, those of D.Sc., LL.D., F.R.S.

EDUCATIONAL SCIENCE

(Address by Prof. JOHN PERRY, D.Sc., LL.D., F.R.S., President of the Section, at the Australian Meeting of the British Association, 1914).

THE English school system has outlived the mediæval conditions which produced it. In old days the only way to knowledge was through Latin : all writing was in Latin. The result then was pretty much what it is now ; lawyers, clergymen, and schoolmasters had to know some Latin after school life ; the average man forgot anything he had learnt. A few very clever men did read, but the average monk or priest was a very ignorant person.

English people know the worthlessness of the public school system in the mental training of the average boy. Why, then, do they submit to it? However conservative they may be they would not submit to this worthless system merely because it is hallowed by a history of five hundred years.

The fact is, this worthless system continues because in some occult way it seems to have a connection with something of real importance,

public school form. There is really no connection. When in my youth, I was a master at one of the great English public schools, like everybody else, I was a frightful prig in regard to public school form. Eton form or Harrow form or Rugby form or Clifton form was the thing at each of these schools which was thought to be of more value than anything else in the world. Dr. Arnold, of Rugby, taught the trick of manufacturing it. It is in itself a splendid thing. The public school boy is trained in self-possession, modesty, cleanliness, truthfulness, and courage. At school his health in body and morals is all-important. He learns to lead and also to obey. But the average resulting man is exceedingly ignorant ; he neither reads nor writes, and he has little reasoning power except what his sports have developed. This form is essentially aristocratic. It is based on superiority of position or birth or taste. A man's place is fixed, his attitude to people of higher or lower rank is fixed. He needs no self assertion, and he cannot become a "bounder," that is, "cad" ; but in Thackeray's sense he is usually a "snob" and in various directions he may be a prig. By prig, I mean a man who cannot get outside convention and so cannot exercise his own common sense. One defect is that public school form when combined with poverty cannot make much money by its own ability, and if it does not starve it must join the valets or the grooms. Its strength lies in convention and habit, and the belief that poor people are not men but a lower kind of animal who may be pitied as we pity a suffering dog. Such pity can never raise the people or reform abuses. In the middle ages young gentlemen of England had the same sort of education. It was probably best in Plantagenet times, when indeed a well-trained young gentleman was not only very healthy and courageous, but he had not much chance of becoming lazy. A man was proud of his heavy armour, and he was trained to act vigorously when carrying it. They were chivalrous to each other, but, alas ! to people outside their own class they were cruel. The Black Prince is typical ; think of his courtesy to King John of France, and then think of his destruction of the persons and property of all the peasantry in those large regions of France which he covered with marauding soldiers. This kind of chivalry, which is never exhibited to a lower class than one's own, has its beauty, but it does not suit a democracy ; it requires that there should be a lower class than its own. The Spartans needed their helots. The Southern planter in America had fine manners, but he could not have cultivated them if there had been no slaves and mean whites. It is a well-known fact that some years before the Civil War in America, it was seriously proposed by prominent Southerners to make slaves of the "mean," that is, the poor whites. The chivalrous Andrew Fletcher of Saltoun showed but little knowledge

of his countrymen when he formed his plan for reducing a large part of the working classes of Scotland to slavery. Public school form may sit not unhandsomely upon country gentlemen or any rich men who have servants or tenants or dependants, but it does not sit at all well upon poorer men, for it puts them out of sympathy with people among whom they must work. It is heartbreaking when associated with the poverty of a man looking for work in places where he has no influential friends, as it is nearly always associated with illiteracy and want of wisdom, with helplessness and with disinclination to learn. Nobody doubts that a modern county gentleman is much more polished than Squire Western or Squire Lumpkin, but he has much the same opinions and forms them in the same way. The manners of a young officer are certainly superior to those of Ensign Northerton, but he is in much the same state of ignorance. Nineteen out of any twenty young officers, if sent to the top of a hill to observe things, cannot write an account of what they see, and they can hardly describe in spoken words what they see, because their vocabulary is too limited. They cannot write a simple letter in English, although they are supposed to have learnt English in the best way, through Latin. On the day when I wrote the last sentence I happened to see the following statement in the "Times." It is from an unimpeachable authority, a man whose business it is to teach young officers how to fill up official forms. He was speaking of their ignorance and describing a special instance: . . . "A young officer shut himself up in a room to write a letter. At the end of two hours he was found sitting, very pale, before a large sheet of paper, on which he had written: 'I say, Cox'—'Cox' being the name of the regimental banker. He did not know even how to begin to write a letter."

We ask the schools for mental power as of old one asked for bread, and they give us a stone. No doubt public school form is a beautiful stone, a diamond; but we want some bread as well, even if it were only in the Falstaffian proportion of bread to sack. For my part I do not see why the average boy at school should not have reasoning power and a love for reading and knowledge as well as good manners, and this is why I ask for a great reform in our schools. We want from the schools what nature has not been accustomed to give, and what home life cannot give, the development of the intellect, and the school fails to give it in ninety-five out of every hundred cases. The great danger in school life is that it may hurt individuality, originality, because a boy, however *harum-scarum*, is naturally conventional and imitative. Good form comes easily, therefore, and the master is more than satisfied, he is proud. He often speaks of it as character, but he is quite wrong.

Character comes from home life, not from school life, which indeed is rather antagonistic to character. It comes from contact with fathers and mothers, brothers and sisters, relations and friends. School life tends to induce a contempt for the lower classes and a slavish admiration of the upper classes, which is altogether wrong in a democracy, and can only lead to evil.

MAX PLANCK

(1851-).

DIRECTOR of the Institute of Theoretical Physics at Berlin University where he holds the Professorship of mathematical physics. He is also a fellow of the Berlin Academy of Science and of numerous foreign societies.

His theory of the atom seems likely to revolutionize the current views on 'indestructible matter,' and to reduce substance to a protean manifestation of energy.

HOW CAN WE KNOW OF AN OUTER WORLD ?

(Address on "New Paths" of Physical Knowledge).

IN the light of recent investigation, the Physical representation of the Universe exhibits an ever more intimate correspondence between its various features, and also manifests a certain peculiar structure whose refinement was hidden to the less trained eye, and therefore remained concealed. But ever the question arises: "What is the significance of this progress in fundamental conceptions for the satisfaction of our thirst for knowledge? Do we approach one step nearer to a real knowledge of nature by the refining of our world image?"

To this fundamental question let us devote a brief consideration. It is not as if anything new could be said in this region, already traversed by manifold and endless speculation, but while on this point modern views are often diametrically opposed, yet every one who takes a deep interest in the real aims of science must necessarily take up some position.

Thirty-five years ago, Hermann von Helmholtz, in this very place, expounded the view that our perceptions never give us an image of, but at most a message from, the external world. For every attempt to demonstrate any kind of similarity between the nature of the external impression and the nature of the corresponding sensation; all conceptions which we make ourselves of the external world only reflect our own sensations in the last resort. Is there any sense, therefore, in opposing

our consciousness of an independent "intrinsic Nature?" Are not indeed so-called "Laws of Nature" essentially but more or less effective rules by which we summarise the temporal course of our sensations as accurately and conveniently as possible? If that were so, then not only common sense but exact Science would have been fundamentally at fault from the beginning. For it is impossible to deny that the whole evolution of physical knowledge up to now has aimed towards the completest fundamental division between the happenings of external nature and the processes of human perception. The way out of this embarrassing difficulty is seen as soon as we go one step further along this line of thought. Let us suppose that a physical presentation of the Universe had been found which fulfils all our demands, and therefore one that completely and accurately represents all laws of Nature empirically known; still that that image even remotely resembles "real" nature, can in no way be proven. But this assertion has another side to it, which is generally too little emphasized: for, in exactly the same sense, the much bolder assertion that the proposed image represents real nature in all points with absolute fidelity cannot be in any way refuted. For the first step in such a disproof would be the ability to assert anything with certainty concerning real Nature, and that, as everybody agrees, is absolutely excluded.

We see that an immense gulf yawns here, into which no Science can ever penetrate. The filling of this gulf is a function not of pure reason, but of practical reason, it is a matter of common sense.

Just as a given cosmic scheme cannot be scientifically established, so we may also be assured that it will survive every attack so long as it agrees with itself and with the facts of experience. But we must not fall into the error of supposing that it is possible to advance, even in the exactest of all sciences, without the help of any world-image, i.e., without any unprovable hypothesis. Even in Physics, the phrase holds good that "There is no salvation without Faith"—at least a faith in a certain reality outside ourselves. It is the confident faith which guides the advancing creative impulse, this it is which gives the necessary support to the groping imagination, this which alone can raise the spirit depressed by failure and inspire it to new efforts. An observer who does not allow himself to be led in his work by any hypothesis, however cautious and provisional, renounces beforehand all deeper understanding of his own results. Whoever rejects faith in the reality of atoms and electrons, or the electro-magnetic nature of light-waves, or the identity of heat and motion, can never be found guilty of a logical or empirical contradiction, but he will find it difficult from his standpoint to advance Physical knowledge.

It is true that Faith alone does nothing. As the history of all science shows, it is liable also to lead astray and to issue in narrowness and fanaticism. If it is to be a reliable guide, it must be constantly tested by the laws of thought and by experience which in the last resort can only be furnished by conscientious and often laborious self-denying solitary work. There is no Prince of Science who is not willing, in case of necessity, to do menial work, whether in laboratory, the library, in the open air, at the writing desk. It is just this hard struggle which ripens and purifies the cosmic view. Only he who has in his own body gone through the process can fully realize its meaning and importance.

And if your honest efforts, verified by many tests, decisively indicate to you new paths differing from the old, then—follow your own conviction beyond any other. That is and must remain your highest, your most precious possession; for just as training for scientific independence is the highest aim of academic instruction, so does a scientific conviction acquired by honest work give a firm anchorage for holding fast to a moral conception of the universe in face of all the vicissitudes of life.

The noblest among all the moral fruits of science, and that which is peculiarly its own, is Truthfulness: that truthfulness which leads through the sense of personal responsibility to inner Freedom, and whose estimation in our present public and private life should be much higher than it is.

WILLIAM HALSE RIVERS

(1864-1922).

HE was born at Luton in 1864, and educated at Tonbridge School and Trinity College, Cambridge (M.A. 1898). Choosing medicine as a profession he became a student in St. Bartholomew's Hospital, London, whence he took the degrees of M.D., and F.R.C.P.

He devoted himself largely to research work, and occupied the post of Lecturer on the Physiology of the Senses ; in addition to editing the "British Journal of Psychology," Dr. Rivers was the author of many papers on scientific subjects:—"The Influence of Alcohol and other Drugs on Fatigue"; the article on "Vision" in Schafer's Text-book of Physiology; "Primitive Conceptions of Death," in the Hibbert Journal; and papers in "Brain," "The Journal of Psychology," etc.

He was president of the Anthropological Section of the British Association in 1911.

MAGIC AND RELIGION

(An Address to Section H, British Association, 1911).

THE most striking example of the permanence of social structure which I have met is in the Hawaiian Islands. There the original native culture is reduced to the merest wreckage. So far as material objects are concerned, the people are like ourselves; the old religion has gone, though there probably still persists some of the ancient magic. The people themselves have so dwindled in number, and the political conditions are so altered, that the social structure has also been greatly modified, and yet I was able to ascertain that one of its elements, an element which I believe to form the deepest layer of the foundation, the very rock of social structure, the system of relationship, is still in use unchanged. I was able to obtain a full account of the system as actually used at the present time, and found it to be exactly the same as that recorded forty years ago by Morgan and Hyde, and I obtained evidence that the system is still deeply interwoven with the intimate life of the people.

If, then, social structure has this fundamental and deeply seated character, if it is the least easily changed, and only changed as the result either of actual blending of peoples or of the most profound political changes, the obvious inference is that it is with social structure that we must begin the attempt to analyse culture and to ascertain how far community of culture is due to the blending of peoples, how far to transmission through mere contact or transient settlement.

The considerations I have brought forward have, however, in my opinion, an importance still more fundamental. If social institutions have this relatively great degree of permanence, if they are so deeply seated and so closely interwoven with the deepest instincts and sentiments of a people that they can only gradually suffer change, will not the study of this change give us our surest criterion of what is early and what is late in any given culture, and thereby furnish a guide for the analysis of culture? Such criteria of early and late are necessary if we are to arrange the cultural elements reached by our analysis in order of time, and it is very doubtful whether mere geographical distribution itself will ever furnish a sufficient basis for this purpose. I may remind you here that before the importance of the complexity of Melanesian culture had forced itself on my mind, I had already succeeded in tracing out a course for the development of the structure of Melanesian society, and after the complexity of the culture had been established, I did not find it necessary to alter anything of essential importance in this scheme. I suggest, therefore, that while the ethnological analysis of cultures must furnish a necessary preliminary to any general evolutionary speculations, there is one element of culture which has so relatively high a degree of permanence that its course of development may furnish a guide to the order of time of the different elements into which it is possible to analyse a given complex.

If the development of social structure is thus to be taken as a guide to assist the progress of analysis, it is evident that there will be involved a logical process of considerable complexity in which there will be the danger of arguing in a circle. If, however, the analysis of culture is to be the primary task of the anthropologist, it is evident that the logical methods of the science will attain a complexity far exceeding those hitherto in vogue. I believe that the only logical process which will in general be found possible will be the formulation of hypothetical working schemes into which the facts can be fitted, and that the test of such schemes will be their capacity to fit in with themselves, or, as we generally express it, "explain" new facts as they come to our knowledge. This is the method of other sciences which deal with conditions as complex as those of human society. In many other sciences these new facts

are discovered by experiment. In our science they must be found by exploration, not only of the cultures still existent in living form, but also of the buried cultures of past ages.

And here is the hopeful aspect of our subject. I believe our present store of facts, at any rate on the less material side of culture, to form but a very small part of that which is yet to be obtained, and will be obtained, unless we very wilfully neglect our opportunities. Waiting to be collected there is a vast body of knowledge by means of which to test the truth of schemes of the history of mankind, not of his migrations and settlements, but of the institutions and objects which have arisen at different stages of his history and developed into various forms throughout the world.

And this brings me to my concluding topic. I have tried to show that any speculation concerning the history of human institutions can only have a sound basis if cultures have first been analysed into their component elements, but I do not wish for one moment to depreciate the importance of attempts to seek for the origin and early history of human institutions. To me the analysis of culture is merely the means to an end, which would have little interest if it did not show us the way to the proper understanding of the history of human institutions. The importance of the facts of ethnology in the study of civilised culture is now generally recognised. You can hardly take up a modern work dealing with any aspect of human thought and activity without finding reference to the customs and institutions of savage or barbarous peoples. It is becoming recognised that a study of these helps us to understand much that is obscure in our own institutions or in those of other great civilisations of the present or the past. Further, there can be no doubt that we are only at the threshold of a new movement in learning which is being opened by this comparative study.

It is a cruel irony that just as the importance of the facts and conclusions of ethnological research is thus becoming recognised, and just as we are beginning to learn sound principles and methods for use both in the fields and in the study, the material of our science is vanishing. Not only is the march of our own civilisation into the hitherto undisturbed places of the earth more rapid than it has ever been before, but this advance has made more easy the spread of other destroying agencies. In many parts of such a region as Melanesia, it is even now only from the old men that any trustworthy information can be obtained, and it is no exaggeration to say that with the death of every old man, there and in other places, there goes, and goes for ever, knowledge the loss of which the scholars of the future will regret as the scholars of the past regretted such an event as the disappearance of the library of Alexandria. There is no

other science in the same position. The nervous system of an animal, the metabolism of a plant, the condition of the South Pole, for instance, will a hundred, or even a thousand years hence, be essentially what they are to-day, but long before the shorter of those times has passed, most, if not all, of the lower cultures now found on different parts of the earth will have wholly disappeared or have suffered such change that little will be learnt from them. Fortunately, the need of ethnographical research is now forcing itself on the attention of those who have to deal with savage or barbarous peoples. Statesmen have begun to recognise the practical importance of knowledge of the institutions of those they have to govern, and missionary societies are beginning to see, what every wise missionary has long known, that it is necessary to understand the ideas and customs of those whose lives they are trying to reform. Still, we must not be content with these more or less official movements. There is ample scope, indeed, urgent need, for individual effort and for non-official enterprise. It is not all who can go into the field and do the needed work themselves, but there are none who cannot in some way help to promote ethnographical research. We have before us one of those critical occasions which must be seized at once if they are to be seized at all: the occasion of a need which to future generations will seem to have been so obvious that its neglect will be an enduring reproach to the science of our time.

THEODORE ROOSEVELT

(1858-1918).

BORN from a prominent New York family of Colonial Dutch or "Knickerbocker" origin, and on his mother's side descended from one of the most noted Colonial families of the original Anglo-Saxon stock in the Southern United States, Theodore Roosevelt had an education which, in its scope of opportunity for learning the different phases of life, probably exceeds that of any other American President. His birth, in 1858, only three years before the Civil War, exempted him in great measure from whatever narrowing influences were inevitably incident to taking part in the actual violence of the struggle of section against section. His accession, in 1901, to fill the vacancy created by the death of a President elected with him on the same party ticket, may seem, at first view, the result of accident, but a knowledge of his career before and since 1901 demonstrates it as a direct result of the forces which operate through his individuality. His family, though its own tradition was one of social exclusiveness, represented politically the idea of equality before the law, perhaps with some tinge of the "noblesse oblige" idea, that the educated American whose own family gives him the best opportunities for individual development is thereby bound to go out among the rest as a leader and guide.

With his own family tradition developed to its logical result by his education at Harvard University, the future President illustrated influences both traditional and educational, when, after leaving Harvard, in 1880, he threw himself fearlessly among the masses in New York City in a struggle with what was then known as the "Tammany tiger." Although representing partisan impulses only incidentally, his election to the New York Assembly gave him opportunities for legislative leadership in New York; the Republican party as then represented accepted his leadership, and confirmed it by making him a delegate to the Republican National convention of 1884.

A memorable incident of his life was his removal, in 1884, to a ranch at Medora, North Dakota, in what, during that period, a leading New York paper called "The Rowdy West." Though he spent only two years there, the strong contrast offered by the "strenuous" life of what was then the frontier to his previous opportunities for education, became a controlling influence at the subsequent crisis of his career.

After his return to New York, in 1886, his education, received prior to his Western experience, appeared in his candidacy for Mayor of New York against Henry George in the triangular contest which elected Abram S. Hewitt. As President of the New York Police Board, he resumed once more the work of political reform he had begun on his first entrance to New York politics. From this work he was called in 1897 to serve as Assistant Secretary of the Navy under President McKinley. Resigning this office to go to Cuba with the "Rough Riders" in 1898, his return to New York after the close of the campaign found him so irresistibly popular as a hero of the Spanish-American war that his nomination as the Republican candidate for Governor of New York could no more be prevented by the "machine" of his own party than his election could be by the other. The same conditions controlled in his selection as the Republican candidate for the Vice-Presidency in 1900.

This explains the comparative independence of his position after his accession to the Presidency in 1901, and his re-election in 1904. While he entered the White House as an incident of party politics formulated with a view to making the period of the Spanish war an era of far-reaching changes in American National life, his individuality could not be calculated on in advance. When he assumed individual leadership, it was largely in disregard of what had been formulated in advance by others, either for himself or for the country. The results have not yet ceased to seem extraordinary, while to many they seem to involve the greatest apparent change of front ever made in any ten years of American political history. The most essential facts of this change are suggested by his Jamestown address.

Theodore Roosevelt ranks among the greatest of modern explorers and big game hunters. In 1913 he visited South America and after giving a series of lectures and addresses, headed a scientific expedition into the heart of Brazil, and added considerably to our knowledge of the head waters of tributaries of the Madeira River. His big game expeditions led him from East Africa to the Rocky Mountains, vivid accounts of which are to be found in his travel books.

During the Great War, Roosevelt was a constant advocate of the Allied cause and occupied himself with many forms of patriotic service, among others proposing to raise a force of volunteers for service in France.

THE MAKING OF AMERICA

(Presidential Address Opening the Jamestown Exposition, April 26th, 1907).

AT the outset I wish to say a word of special greeting to the representatives of the foreign governments here present. They have come to assist us in celebrating what was in very truth the birthday of this nation, for it was here that the colonists first settled, whose incoming, whose growth from their own loins and by the addition of newcomers from abroad, was to make the people which 169 years later assumed the solemn responsibilities and weighty duties of complete independence.

In welcoming all of you I must say a special word first to the representative of the people of Great Britain and Ireland.

The fact that so many of our people, of whom as it happens I myself am one, have but a very small portion of English blood in our veins in no way alters the other fact that this nation was founded by Englishmen, by the Cavalier and the Puritan. Their tongue, law, literature, the fund of their common thought, made an inheritance which all of us share, and marked deep the lines along which we have developed. It was the men of English stock who did the most in casting the mould into which our national character was run.

Let me furthermore greet all of you, the representatives of the people of continental Europe. From almost every nation of Europe we have drawn some part of our blood, some part of our traits. This mixture of blood has gone on from the beginning, and with it has gone on a kind of development unexampled among peoples of the stocks from which we spring; and hence to-day we differ sharply from, and yet in some ways are fundamentally akin to, all of the nations of Europe.

Again, let me bid you welcome, representatives of our sister republics of this continent. In the larger aspect, your interests and ours are identical. Your problems and ours are in large part the same, and as we strive to settle them, I pledge you herewith on the part of this nation the heartiest friendship and good-will.

Finally, let me say a special word of greeting to those representatives of the Asiatic nations who make up that newest East which is yet the most ancient East, the East of time immemorial. In particular, let me express a word of hearty welcome to the representative of the mighty island empire of Japan; that empire which, in learning from the West has shown that it has so much, so very much, to teach the West in return.

To all of you here gathered I express my thanks for your coming and I extend to you my earnest wishes for the welfare of your several nations. The world has moved so far that it is no longer necessary to believe that one nation can rise only by thrusting another down. All far-sighted statesmen, all true patriots, now earnestly wish that the leading nations of mankind, as in their several ways they struggle constantly toward a higher civilization, a higher humanity, may advance hand in hand, united only in a generous rivalry to see which can best do its allotted work in the world. I believe that there is a rising tide in human thought which tends for righteous international peace; a tide which it behoves us to guide through rational channels to sane conclusions; and all of us here present can well afford to take to heart St. Paul's counsel: "If it be possible, as much as lieth in you, live peaceably with all men."

We have met to-day to celebrate the opening of the exposition which itself commemorates the first permanent settlement of men of our stock in Virginia, the first beginning of what has since become this mighty republic.

Three hundred years ago a handful of English adventurers, who had crossed the ocean in what we should now call cockle boats, as clumsy as they were frail, landed in the great wooded wilderness, the Indian-haunted waste, which then stretched down to the water's edge along the entire Atlantic coast. They were not the first men of European race to settle in what is now the United States, for there were already Spanish settlements in Florida, and on the headwaters of the Rio Grande; and the French, who at almost the same time were struggling up the St. Lawrence, were likewise destined to form permanent settlements on the Great Lakes and in the valley of the mighty Mississippi before the people of English stock went westward of the Alleghanies. Moreover, both the Dutch and the Swedes were shortly to found colonies between the two sets of English colonies, those that grew up around the Potomac and those that grew up on what is now the New England coast. Nevertheless, this landing at Jamestown possesses for us of the United States an altogether peculiar significance, and this without regard to our several origins. The men who landed at Jamestown, and those who thirteen years later landed at Plymouth, all of English stock, and their fellow-settlers who during the next few decades streamed in after them, were those who took the lead in shaping the life history of this people in the colonial and revolutionary days.

It was they who bent into definite shape our nation while it was still young enough most easily, most readily, to take on the characteristics which were to become part of its permanent life habit.

Yet let us remember that while this early English colonial stock has left deeper than all others upon our national life the mark of its strong twin individualities, the mark of the Cavalier and of the Puritan,—nevertheless, this stock, not only from its environment, but also from the presence with it of other stocks, almost from the beginning, began to be differentiated strongly from any European people. As I have already said, about the time the first English settlers landed here, the Frenchman and the Spaniard, the Swede and the Dutchman, also came hither as permanent dwellers, who left their seed behind them to help shape and partially to inherit our national life. The German, the Irishman and the Scotchman came later, but still in colonial times.

Before the outbreak of the revolution the American people, not only because of their surroundings, physical and spiritual, but because of the mixture of blood that had already begun to take place, represented a new and distinct ethnic type. This type has never been fixed in blood. All through the colonial days new waves of immigration from time to time swept hither across the ocean, now from one country, now from another. The same thing has gone on ever since our birth as a nation ; and for the last sixty years the tide of immigration has been at the full. The newcomers are soon absorbed into our eager national life, and are radically and profoundly changed thereby, the rapidity of their assimilation being marvellous. But each group of newcomers, as it adds its blood to the life, also changes it somewhat, and this change and growth and development, have gone on steadily, generation by generation, throughout three centuries.

The pioneers of our people who first landed on these shores on that eventful day three centuries ago, had before them a task which during the early years was of heartbreaking danger and difficulty. The conquest of a new continent is iron work. People who dwell in old civilizations and find that therein so much of humanity's lot is hard, are apt to complain against the conditions as being solely due to man, and to speak as if life could be made easy and simple if there were but a virgin continent in which to work. It is true that the pioneer life was simpler, but it was certainly not easier. As a matter of fact, the first work of the pioneers in taking possession of a lonely wilderness is so rough, so hard, so dangerous, that all but the strongest spirits fail. The early iron days of such a conquest search out alike the weak in body and the weak in soul. In the warfare against the rugged sternness of primeval nature, only those can conquer who are themselves unconquerable. It is not until the first bitter years have passed that the life becomes easy enough to invite a mass of newcomers, and so great are the risk,

hardship and toil of the early years that there always exists a threat of lapsing back from civilization.

The history of the pioneers of Jamestown, of the founders of Virginia, illustrates the truth of all this. Famine and pestilence and war menaced the little band of daring men who had planted themselves alone on the edge of a frowning continent. Moreover, as men ever find, whether in the tiniest frontier community or in the vastest and most highly organized and complex civilized society, their worst foes were in their own bosoms. Dissension, distrust, the inability of some to work and the unwillingness of others, jealousy, arrogance and envy, folly and laziness—in short, all the shortcomings with which we have to grapple now, were faced by those pioneers, and at moments threatened their whole enterprise with absolute ruin. It was some time before the ground on which they landed supported them, in spite of its potential fertility, and they looked across the sea for supplies. At one moment so hopeless did they become that the whole colony embarked, and was only saved from abandoning the country by the opportune arrival of help from abroad.

At last they took root in the land, and were already prospering when the Pilgrims landed at Plymouth. In a few years a great inflow of settlers began. Four of the present states of New England were founded. Virginia waxed apace. The Carolinas grew up to the south of it and Maryland to the north of it. The Dutch colonies between, which had already absorbed the Swedish, were in their turn absorbed by the English. Pennsylvania was founded and, later still, Georgia. There were many wars with the Indians and with the dauntless captains whose banners bore the lilies of France. At last the British flag flew without a rival in all Eastern North America. Then came the successful struggle for national independence.

For half a century after we became a separate nation there was comparatively little immigration to this country. Then the tide once again set hither, and has flowed in ever increasing size until in each of the last three years a greater number of people came to these shores than had landed on them during the entire colonial period. Generation by generation these people have been absorbed into the national life. Generally their sons, almost always their grandsons, are indistinguishable from one another and from their fellow-Americans, descended from the colonial stock. For all alike the problems of our existence are fundamentally the same, and for all alike these problems change from generation to generation.

In the colonial period, and for at least a century after its close, the conquest of the continent, the expansion of our people westward, to the Alleghanies, then to the Mississippi, then to the Pacific, was always

one of the most important tasks, and sometimes the most important, in our national life. Behind the first settlers the conditions grew easier, and in the older settled regions of all the colonies life speedily assumed much of comfort and something of luxury ; and though generally it was on a much more democratic basis than life in the old world, it was by no means democratic when judged by our modern standards ; and here and there, as in the tidewater regions of Virginia, a genuine aristocracy grew and flourished.

But the men who first broke ground in the virgin wilderness, whether on the Atlantic coast or in the interior, fought hard for mere life. In the early stages the frontiersman had to do battle with the savage, and when the savage was vanquished there remained the harder strain of war with the hostile forces of soil and climate, with flood, fever, and famine. There was sickness and bitter weather ; there were no roads ; there was a complete lack of all but the very roughest and most absolute necessities. Under such circumstances the men and women who made ready the continent for civilization were able themselves to spend but little time in doing aught but the rough work which was to make smooth the ways of their successors. In consequence observers whose insight was spoiled by lack of sympathy always found both the settlers and their lives unattractive and repellant. In " Martin Chuzzlewit " the description of America, culminating in the description of the frontier town of Eden, was true and lifelike from the standpoint of one content to look merely at the outer shell ; and yet it was a community like Eden that gave birth to Abraham Lincoln ; it was men such as were therein described from whom Andrew Jackson sprang.

Hitherto each generation among us has had its allotted task, now heavier, now lighter. In the Revolutionary war the business was to achieve independence. Immediately afterward there was an even more momentous task ; that to achieve the national unity and the capacity for orderly development, without which our liberty, our independence, would have been a curse and not a blessing.

In each of these two contests, while there were many great leaders from many different states, it is but fair to say that the foremost place was taken by the soldiers and the statesmen of Virginia, and to Virginia was reserved the honour of producing the hero of both movements, the hero of the war and of the peace that made good the results of the war—George Washington ; while the two great political tendencies of the time can be symbolized by the names of two other great Virginians—Jefferson and Marshall—from one of whom we inherit the abiding trust in the people which is the foundation-stone of democracy, and from the

other the power to develop on behalf of the people a coherent and powerful government, a genuine and representative nationality.

Two generations passed before the second great crisis of our history had to be faced. Then came the Civil war, terrible and bitter in itself and in its aftermath, but a struggle from which the nation finally emerged united in fact as well as in name, united forever.

Oh, my hearers, my fellow-countrymen, great indeed has been our good fortune ; for as time clears away the mists that once shrouded brother from brother, and made each look " as through a glass darkly " at the other, we can all feel the same pride in the valour, the devotion and the fealty toward the right as it was given to each to see the right, shown alike by the men who wore the blue and by the men who wore the gray.

Rich and prosperous though we are as a people, the proudest heritage that each of us has, no matter where he may dwell, north or south, east or west, is the immortal heritage of feeling the right to claim as his own all the valour and all the steadfast devotion to duty shown by the men of both the great armies, of the soldiers whose leader was Grant and the soldiers whose leader was Lee.

The men and the women of the Civil war did their duty bravely and well in the days that were dark and terrible and splendid. We, their descendants, who pay proud homage to their memories, and glory in the feats of might on one side no less than on the other, need to keep steadily in mind that the homage which counts is the homage of heart and of hand, and not of the lips, the homage of deeds and not of words only. We, too, in our turn, must prove our truth by our endeavours. We must show ourselves worthy sons of the men of the mighty days by the way in which we meet the problems of our own time. We carry our heads high because our fathers did well in the years that tried men's souls, and we must in our turn so bear ourselves that the children who come after us may feel that we, too, have done our duty.

We cannot afford to forget the maxim upon which Washington insisted, that the surest way to avert war is to be prepared to meet it. Nevertheless, the duties that most concern us of this generation are not military, but social and industrial. Each community must always dread the evils which spring up as attendant upon the very qualities which give it success. We of this mighty Western republic have to grapple with the dangers that spring from popular self-government tried on a scale incomparably vaster than ever before in the history of mankind, and from an abounding material prosperity greater than anything which the world has hitherto seen.

As regards the first set of dangers, it behoves us to remember that men can never escape being governed. Either they must govern themselves or they must submit to being governed by others. If from lawlessness or fickleness, from folly or self-indulgence, they refuse to govern themselves, then most assuredly in the end they will have to be governed from the outside. They can prevent the need of government from without only by showing that they possess the power of government from within. A sovereign cannot make excuses for his failures; a sovereign must accept the responsibility for the exercise of the power that inheres in him; and where, as is true in our republic, the people are sovereign, then the people must show a sober understanding and a sane steadfast purpose if they are to preserve that orderly liberty upon which as a foundation every republic must rest.

In industrial matters our enormous prosperity has brought with it certain grave evils. It is our duty to try and cut out these evils without at the same time destroying our well-being itself. This is an era of combination alike in the world of capital and in the world of labour. Each kind of combination can do good, and yet each, however powerful, must be opposed when it does ill. At the moment the greatest problem before us is how to exercise such control over the business use of vast wealth, individual, but specially corporate, as will insure its not being used against the interest of the public, while yet permitting such ample legitimate profits as will encourage individual initiative. It is our business to put a stop to abuses and to prevent their recurrence without showing a spirit of mere vindictiveness for what has been done in the past. In John Morley's brilliant sketch of Burke he lays especial stress upon the fact that Burke, more than almost any other thinker or politician of his time, realized the profound lesson that in politics we are concerned not with barren rights, but with duties; not with abstract truth, but with practical morality. He especially eulogizes the way in which, in his efforts for economic reform, Burke combined unshakable resolution in pressing the reform with a profound temperateness of spirit which made him, while bent on the extirpation of the evil system, refuse to cherish an unreasoning and vindictive ill-will toward the men who had benefited by it. Said Burke: "If I cannot reform with equity, I will not reform at all. . . . (There is) a state to preserve as well as a state to reform."

This is the exact spirit in which this country should move to the reform of abuses of corporate wealth. The wrong-doer, the man who swindles and cheats, whether on a big scale or a little one, shall receive at our hands mercy as scant as if he committed crimes of violence or brutality. We are unalterably determined to prevent wrong-doing in

the future ; we have no intention of trying to wreak such an indiscriminate vengeance for wrongs done in the past as would confound the innocent with the guilty. Our purpose is to build up rather than to tear down. We show ourselves the truest friends of property when we make it evident that we will not tolerate the abuses of property. We are steadily bent on preserving the institution of private property ; we combat every tendency toward reducing the people to economic servitude ; and we care not whether the tendency is due to a sinister agitation directed against all property, or whether it is due to the actions of those members of the predatory classes whose antisocial power is immeasurably increased because of the very fact that they possess wealth.

Above all, we insist that while facing changed conditions and new problems, we must face them in the spirit which our forefathers showed when they founded and preserved this republic. The corner stone of the republic lies in our treating each man on his worth as a man, paying no heed to his creed, his birthplace, or his occupation, asking not whether he is rich or poor, whether he labours with his head or hand ; asking only whether he acts decently and honourably in the various relations of his life, whether he behaves well to his family, to his neighbours, to the state. We base our regard for each man on the essentials and not the accidents.

We judge him not by his profession, but by his deeds ; by his conduct, not by what he has acquired of this world's goods. Other republics have fallen because the citizens gradually grew to consider the interest of a class before the interests of the whole ; for when such was the case it mattered little whether it was the poor who plundered the rich or the rich who exploited the poor ; in either event the end of the republic was at hand. We are resolute in our purpose not to fall into such a pit.

This great republic of ours shall never become the government of a plutocracy and it shall never become the government of a mob. God willing, it shall remain what our fathers who founded it meant to be—a government in which each man stands on his worth as a man ; where each is given the largest personal liberty consistent with securing the well-being of the whole, and where, so far as in us lies, we strive continually to secure for each man such equality of opportunity that in the strife of life he may have a fair chance to show the stuff that is in him. We are proud of our schools and of the trained intelligence they give our children the opportunity to acquire. But what we care for most is the character of the average man ; for we believe that if the average of character in the individual citizen is sufficiently high, if he possesses those qualities which make him worthy of respect in his family

life and in his work outside, as well as the qualities which fit him for success in the hard struggle of actual existence—that if such is the character of our individual citizenship, there is literally no height of triumph unattainable in this vast experiment of government by, of and for a free people.

SIR RONALD ROSS

M.D., K.C.B., F.R.S.

(1859-).

GENERALLY known as the apostle of tropical sanitation. He was educated at St. Bartholomew's Hospital, London, entered the Indian Medical Service in 1881 and commenced his special study of the problem of malaria in 1892, in which year he received the Parkes gold medal. About this time he undertook experiments to verify the mosquito theory of malaria. These researches were successful. By working out the life history of the parasites, he discovered that the disease was transmitted by mosquito bites from the insect to mankind.

Malaria was thus found to have nothing to do with "bad air" at all but to be a disease prevalent in swampy places, because such spots form breeding grounds for the mosquitoes which harbour the parasites and form centres of infection.

Sir Ronald Ross was the leader of an expedition which investigated the malaria-bearing mosquitoes of West Africa in 1899. In 1902 his brilliant work was recognised by the award of the Nobel Prize for Medicine. His writings are of great variety and embrace works in medical theory, mathematics, novels and poetry.

PROBLEMS OF EDUCATION

(Presidential Address delivered in London on December 31st, 1918).

MANY problems of education would be solved if a really good scientific test of the results of education could be invented. I can imagine that if such a test were to be applied, say, once a year to all the forty million or so residents in this country, beginning with the British workman and ascending, or descending, to the Houses of Parliament, and even to the Royal Society, the results might be surprising. But as no such test is known, all we can do is to try to form some kind of personal estimate and integration, just as we try to measure lengths and areas by the eye—a method full of fallacies, but unfortunately, perhaps, the only one available. I propose, therefore, to offer for your consideration, as briefly as possible, my own life-notes on the subject.

Let us begin with physical education. Here, I think, the British system has deservedly set the fashion throughout the world. The young men of most countries have certain national games, but since the time of the ancient Greeks no nation has so assiduously practised in the whole field of bodily exercise—very much, in my opinion, to our advantage. That field is a very large one—first, the great natural exercises, running, swimming, rowing, riding, and climbing; secondly, the games, cricket, football, tennis, polo, and others; thirdly, the sports, fishing, shooting, and hunting; fourthly, special kinds of muscular training, such as gymnastics, boxing, and fencing; and, fifthly, military training. Now all these are invaluable, not only for the body, not only to maintain the *mens sana in corpore sano*, but also as exercises for most of the faculties of the mind and spirit. For this reason I attach the least value to the artificial exercises, so popular on the Continent, as gymnastics and fencing; and not so much to the games as to the natural exercises and sports. It has been the great merit of British education to have discovered the superlative educating capacity of what are often called mere pastimes and amusements. Yet this has been quite a modern discovery, and many nations are still only just learning the lesson from us. When I read Russian and French novels, and even some works of Dickens and other English writers, I seem to be living in a museum of pathological specimens, and not among men and women who have breathed God's air and seen the sunlight.

This leads to the all-important question of human physique—too large a theme for discussion now. But from my own observations made in many countries I conclude that variations in physique show such peculiar local distribution that we must attribute them more to environment than to heredity. What the principal cause of physical deterioration, combined as it generally is with mental and moral deterioration, may be escapes me. It cannot be entirely disease, or alcoholism, or underfeeding, or overcrowding, or climate, but must be some unknown factor which has not yet been discovered. On the other hand, speaking as a military medical officer, I will say with certainty that a period of open-air military training under discipline, combined with good food, greatly improves the physique, the health, and the mental powers of young men, let alone their manners and *morale*. For this reason I should be in favour of universal military training everywhere; but, on the other hand, I admit the force of the argument that such military training may be an incentive to puerile wars—though I am not sure of it. On the whole, therefore, I would at least suggest an alternative scheme—that is, a scheme of what I call “health conscription,” consisting of at least a fortnight's compulsory physical training, under discipline, in the open air, for both sexes

every year for five years between the ages, say, of fifteen and twenty. There will, of course, be the usual objections on the score of expense and interference with so-called liberty ; but the alternative appears to me to be continued deterioration of body and mind. The public schools of Britain have set the example in what may be called physical religion ; my proposal is merely to extend that faith to all classes.

Coming now to the actual knowledge obtained by the young in our schools, I have concluded that it is really not very much. My complaint (and that of others) is not so much as to the total amount of information imparted as to the direction of it. As everyone knows, our teaching has been concerned chiefly with mathematics and the classics, with the outlines of history and of English literature. First taking mathematics (which is a hobby of mine), my observation is that few young men know even the aims and objects of the science, much less its applications, although they may have studied it for years at school. If you ask them they will reply, " Mathematics is doubtless very fine, but I don't know what the dickens it is all about ; and, anyway, it is no use to me." The reason for this is that the schoolboy is not pushed fast enough into the heart of the science, which is the calculus. He is kept, so to speak pottering about with petty problems in the porch of the temple, and is never allowed to look into the temple itself and to see the beauties within. In fact, the whole subject is taught, not as a great science, but as an opportunity for exercising the mind by a system of puzzles. The error is that of entering into too great detail at the outset. Instead of climbing the mountain, we are kept wandering among the boulders at its base ; we become tired ; we abandon our enterprise ; and the time and money spent on it are almost entirely wasted. I once wished to give a simple mathematical demonstration to a class of more than twenty medical officers ; only one of them knew the meaning of a differential coefficient !

As regards the classics, my complaint is, not that boys are taught the " humanities," but that they are *not* taught them. The fundamental mistake seems to be the same as in mathematics—too great detail at the outset. The study of the history, literature, art, and politics of the human race degenerates into the meticulous study of the alphabet of the subject only—that is, Greek and Latin grammar. Why do we still learn these languages ? In order to read Greek and Latin literature. But after we have spent years in learning the languages, we become so tired of them that we do not read the literature at all ! I am a bad linguist, but an ardent admirer of classical literature ; yet when I was a young man I noted that many of my friends were good linguists, but hated the literature. Surely a waste of time and money again. The book is

opened ; a few words are deciphered ; the scholium is read ; and the book is closed again—and for ever.

So also with our teaching in most things—we potter about the porch and never look into the temple at all. How often, for example, are our boys taken into the picture galleries, those great temples of the human spirit, and there taught the history and the meaning of the art enshrined in them ? Or how often are they taken to hear the reading of our own national poems or the music of the great composers ? Seldom, I think ; and when they escape from school they take to the reading of shilling novels and the viewing of contemptible plays.

It is usually, and rightly, maintained that the aim of all education is to endow the young with character, judgment, and knowledge ; but when people argue that the relative importance of these qualities is in the order given—that character comes first, then judgment, and lastly knowledge—I am inclined to disagree. We have here, indeed, a trinity of elements all necessary for educational salvation, but all three are so closely knit together that we cannot do without one of them. Without character one can possess neither judgment nor knowledge ; without judgment, neither character nor knowledge ; without knowledge, neither character nor judgment. How, for instance, may a person who consents to remain ignorant of all the knowledge which science has given to us be said to possess character ? And as for judgment, it is not a faculty bestowed upon us *a priori* at birth, but one which grows with exercise. Shelley fixed the argument when he said of one of the highest virtues :

“ Love is like understanding, that grows bright
Gazing on many truths.”

Similarly breathing, sleep, and food are all necessary for bodily salvation ; and one might as well say that the relative importance of these is in the order named. The point is worth noting, because it has become the fashion lately to decry knowledge especially. “ Be good,” says one, “ and let who will be wise ” ; and Tennyson exclaims of knowledge, “ Let her know her place ; she is the second, not the first.”

Such sayings are based upon a false psychology ; for the mind is not a thing of only one or two dimensions, but of three, and there is no first and no second where all three are equal. One might as well say, “ It is nobler to breathe and to sleep than to eat ; therefore let us do without food.” And, indeed, this is the actual faith of the Indian fakir, leading to a futile philosophy which was becoming very prevalent even in this country before the war, and which I called “ fakirism.” When this evil spirit enters into the mind of a nation, that nation is

doomed. Like the Indian fakir, it will be content to sit by the roadside of life and to achieve nothing thereafter except the pursuit of idle dreams, as many nations have done and are doing. It is your mission, I take it, to contend against this spirit; to rouse the fakir, and to put some of the abhorred beef and bread of natural science into him, so that he shall begin to do honest work again.

All this is really very pertinent to our theme. For if knowledge is of no account, why trouble to teach any at all? But if it is of some account, then why not teach knowledge that is useful as well as sound? But here we strike at once across two dogmas which I have often seen repeated in educational literature. The first is that the object of education is not to impart knowledge, but to exercise the mind in the art of acquiring knowledge for itself in after-years. There is some truth in that, but also a fallacy. For how can we exercise a mind in the art of acquiring knowledge except by the practice of that art? We might as well try to teach a boy to swim without putting him in water. Then there is the second dogma, which is just the opposite—that what is taught at all must be taught thoroughly. Now I am no teacher of young boys myself, but I doubt the policy. I think that it is advocated in disregard of the natural law that living beings tend to hate a food which is offered to them too constantly. Moreover, we can never know in which direction a boy's aptitude really lies; and, lastly, it is impossible to teach anything thoroughly to anyone, for all knowledge is infinite. I conclude, therefore (though I may be wrong), that it is not good to bury a youth at the bottom of a mine in order that he shall search there for some gold which perhaps he will never find; but that it is better to take him speedily to a height whence he can survey the whole world and choose for himself the field for his own future work.

Neither you nor I will pretend that natural science is to be the only subject to be taught; but I cannot conceive how anyone who does not possess some broad knowledge of the immense accumulation of facts about Nature collected by humanity during the last two thousand years can dare to call himself an educated person. Some years ago a headmaster whose name I have forgotten maintained that a study of the stars is unimportant for men. He meant, not men, but earthworms. A man is or ought to be, something more than an animal, and the very definition of him is that he *shall* study the stars.

Of course, in this very brief survey I have been obliged to omit reference to some points even of the first importance, such as manners and *morale*, for instance; and to exclude university education, which is the privilege only of a few persons. I will conclude now with the following summary of my own opinions—for what they are worth. I

think that our system of open-air education, in which the public schools set the example, is a most invaluable and essential part of education. Closely connected with it is the principle of personal honour, good temper, and duty—that is, a spirit of *noblesse oblige*, which that open-air education, more than anything else, fosters and inculcates. On the other hand, I think that our system of education is defective as regards the imparting of fundamental knowledge. Most of the great knowledges of humanity are not implanted in the minds of our youth—not only the great discoveries of science, but also the great discoveries of literature, including classical literature, and of the high poetry, painting, music, and philosophy, which constitute the principal heritage of the human race. Indeed, knowledge is often actually derided by the numerous apostles of ‘ fakirism ’ in this country, or replaced by a useless lumber of unimportant matter ; and foreign languages and many of the petty but useful arts of life are much neglected. Hence the whole intellectual side of life is too frequently ignored, or even despised, by the masses of the people, with the result that their judgment is starved for lack of facts, and that they become too often the slaves of fads and quackeries and unproven dogmas of every description—party politics, meretricious propagandas, ignoble creeds, and even sometimes superstitions that savages would laugh at. But behind these and other defects the nation possesses by nature a kindliness, a sense of humour and fair play, and an unopposable force of good intention which have made it during the last four years the pattern and exemplar of the world.

LORD JOHN RUSSELL

(1792-1878).

LORD JOHN RUSSELL, created first Earl Russell in 1861, was the third son of the Duke of Bedford. He was born at London, August 18th, 1792. After graduating at the University of Edinburgh, he entered Parliament in 1813. From 1819, when he began his advocacy of Parliamentary Reform, until his retirement from public life, he was prominent as a champion of all the great Whig and Liberal measures of his time. He advocated Catholic Emancipation, the repeal of the Test Act, and the Reform Bill of 1831. His success as a champion of Reform made him the Whig leader in 1834, and after holding various important places in the Cabinet, he became Prime Minister in 1846, retaining the position for six years and resuming it again in 1865. In one way or another his name is connected with most of the greatest events of English history during his day. He died May 28th, 1878. Although his political addresses are numerous and important, it is doubtful if any one of them represents his intellectual force as fully as his Leeds address of 1852, here given. Among literary addresses it ranks with those of Gladstone and Goldwin Smith.

SCIENCE AND LITERATURE AS MODES OF PROGRESS

(Delivered before the Members of the Leeds Mechanics' Institution,
December 8th, 1852).

YOUR excellent president having conveyed to me a wish that I should preside at this meeting of the Leeds Mechanics' Institution, I had great pleasure in complying with his request; for, since the first establishment of mechanics' institutes, I have had the greatest satisfaction in seeing how much they have contributed to the instruction of those who belong to them, as they have to the general knowledge and the general welfare of the country. I had the pleasure of assisting Dr. Birkbeck in the beginning of these institutions. I wish now, as far as I am able, to address you upon some points of general concern. My ignorance of the particulars and details relating to these institutions would make it an impertinence on my part if I were to attempt to go into those matters to which your president has referred. I am glad

to say that from the last report of the institution it appears that the various objects to which it is intended to minister—the schools, the classes, the instructions of various kinds, and the libraries, have all been well supported, and that there are not less than two thousand members belonging to your association. It occurs to me, however, that if I can address anything to you worthy of observation, it should be rather upon the general state of knowledge at this time, and the prospect of what is before us, than upon any particulars relating to the institution over which I am now presiding. Let us observe how very different the present state of affairs is from the time when great foundations were made for the purposes of education and instruction. Before the Reformation, and immediately afterwards, great sums of money and land were given for the purposes of endowing academies, colleges, and schools for education. Our ancestors thought, and I believe wisely thought, that the best plan they could adopt was to teach, or to provide means for teaching, the science and literature which had been derived from ancient nations ; for in those days that science and that literature contained all that was known, and was really worthy of study, the most profound works, upon subjects of geometry and science, and the best models of literary writing. I am far from thinking that our ancestors committed an error, either when they directed the education of youth almost exclusively to these objects, or when they decided that a great length of time should be given to that knowledge ; but we have to consider that in the present day we stand in a totally different position. Not that we ought to forget what great advantages we have derived from the science and the literature of ancient nations ; because upon the geometry delivered to us from the ancients has been founded all that increase of knowledge which ended in the discoveries of Newton ; from the writings of the poets of antiquity the great poets of modern times have derived the best models they could imitate ; from the jurisprudence of the Romans were derived the laws by which most of the nations of the Continent have been ruled. But, while this tribute must be paid, it is a paramount object of attention that we, in the course of the three centuries and a half that have elapsed from what is called “ the revival of letters,” have added to the stores that we have received immense stores of our own,—that by the side of that rich mine we have opened other mines, which, if not of richer ore, are more easily worked and more abundant in their produce. It was Bacon who first pointed out that the mode of the pursuit of science for modern nations ought to be different from that mode for the discovery of truth which has been pointed out by some of the great philosophers. It has been much questioned whether Bacon was in fact the guide by whom other discoverers have been enabled to pursue

the track of knowledge and of invention, and upon that point I think it is certainly clear that it was not Bacon who enabled Galileo and Torricelli, Pascal, Tycho Brahe, Copernicus, and Kepler to make the great discoveries which have immortalized their names.

But what is true is that Bacon at a very early period laid down the rules by which all modern men of science have guided themselves. He pointed out the road they have followed, and laid down more clearly, more broadly, more ably than any one else, the great method by which modern discovery should be pursued. You will find, I think, if you pursue this subject—if those who belong to mechanics' institutes will study the two works of Bacon, the one called the 'New Organ,' and the other 'The Instauration of the Sciences,'—you will find that the latest discoveries, the latest inventions, have been made according to that mode which he pointed out. A work was published but a year ago by Mr. Fairbairn, giving an account of the experiments which he adopted under the direction of Mr. Stephenson, and by which that gentleman was enabled to construct the tubular bridges at Conway and over the Menai Straits. You will find that all those experiments were according to the rules which Bacon has laid down. Take another on geology, and a most interesting work it is, called the 'Old Red Sandstone,' by Mr. Hugh Miller, and you will find in that interesting work, which is as remarkable for the beauty of its style as for the importance of its matter, that Mr. Hugh Miller, being at first a mason working in a stone quarry, pursued, in his method of investigation, the same rules which Bacon more than three centuries ago, laid down, and which have thus become the foundation of the law, as it were, of modern science. And now, ladies and gentlemen, having said this much with regard to the original method, let me venture to say that, interested as no doubt the members of the Mechanics' Institute may be in the various sciences which of late have made so great a progress,—that, interesting to you as are those discoveries which have given us the power of rapid locomotion and the electric telegraph,—wonderful and extraordinary as all those discoveries are, and the study of the means and methods by which they were made, I would earnestly press upon you that there is one science which, though its practical use is rather upon the sea than upon the land, is yet worthy of the deepest study, on account of the magnificent results which it unfolds. The science to which I allude is the science of astronomy. Whether those who, having begun the mathematical studies with the simplest problems of geometry, wish to pursue them to the end, and follow the works of Newton himself,—and no more interesting works can be studied by a mathematician,—with the view of seeing how it was that he discovered that great law of gravitation by which his name

will be forever known, or whether, contenting yourselves with the popular accounts of astronomy in many of the works of the day, written by Sir John Herschel and other eminent men,—whether you pursue one branch or the other,—you cannot fail to be struck with the dread magnificence of heaven which is unfolded to you in astronomical speculations. That course of discovery, be it remarked, is still open—it is still pursued ; and it is but lately that it has been found that those parts of the heavens which seem to be mere collections of luminous clouds, and not to contain anything like form of world or form of suns, are in fact full of stars, small in appearance to us, but really of very great magnitude, though at an immensely remote distance ; so that, as it were, a new heaven is opened to us, and it appears that to Him to whom “ a thousand years are but a day ” a thousand worlds are but a speck. I certainly shall not attempt to detain you and to occupy your time by speaking of any of those other sciences which have all their delight and their utility. Let me only say that there cannot be a greater mistake than that which prevailed a number of years ago, when I first visited this district ; and I am sorry to say it is now forty years since I came into the district, and, in company with a learned and eminent man, the late Professor Playfair, visited your factories and your workshops. I was struck—I could not fail to be struck—by the ingenuity displayed by the wealth that was obtained ; but I own that I left the manufacturing districts with somewhat of a painful feeling that no greater means were used to spread and obtain knowledge, and that a theory seemed to prevail, a false and unfounded theory I am sure it was—that those who are continually occupied in toiling and in spinning, in hammering and in forging, could not obtain time or have the means of penetrating the recesses of science and of literature. I believe that no doctrine ever was more false ; and experience has, indeed, proved that, while science and literature add to the skill and to the ability by which the artisan conducts his trade, on the other hand his toil is sweetened by the comfort of thinking that he can read and instruct himself when his hour of leisure shall arrive. Gentlemen, I noted in a journal I kept at that time the various manufactures I had visited and the inventions I had seen, and I ended with a few observations on the moral and intellectual state of the manufacturing districts, expressing, with the sanguine hope of youth, a confident expectation that great improvement would be made in these respects ; and I come now, after this long period, to rejoice in the prospect that that hope is being fulfilled.

I will now turn for a short time to the subject of literature. That subject again is so vast that if I were to attempt to go over any one of its numerous fields I should not find the time sufficient to enable

me to do so ; but there is one leading remark which I will venture to make, and which, I think, it is worth while for any person who studies literature to keep in view. There are various kinds of productions of literature of very different forms and of very different tastes,—some grave and some gay, some of extreme fancy, some rigorously logical, but all, as I think, demanding this as their quality,—that truth shall prevail in them. A French author has said that nothing is beautiful but truth ; that truth alone is lovely, but that truth ought to prevail even in fable. I believe that remark is perfectly correct ; and I believe that you cannot use a better test, even of works of imagination, than to see whether they be true to nature. Now, perhaps, I can better explain what I mean in this respect by giving you one or two instances than I should be able to do by precept and explanation. A poet of very great celebrity in the last century, who certainly was a poet distinguished for much fancy and great power of pathos, but who had not the merit of being always as true as he is pointed in the poetry he has written,—I mean Young,—has said, at the commencement, I think, of one of his ‘ Nights ’ :—

“ Sleep, like the world, his ready visit pays
Where Fortune smiles ; the wretched he forsakes,
And lights on lids unsullied with a tear.”

Now, if you will study that sentence, you will see there are two things which the poet has confounded together. He has confounded together those who are fortunate in the possession of health, and those who are fortunate in worldly advantages. Now, it frequently happens that the man who is the worse off in his worldly circumstances,—to whom the world will pay no homage,—on whom it would not be said that Fortune smiled, enjoys sweeter and more regular sleep than those who are in the possession of the highest advantages of rank and wealth. You will all remember, no doubt, that in a passage I need not quote, another poet,—one always true to nature,—Shakespeare, has described the shipboy amidst the storm, notwithstanding all the perils of his position on the mast, as enjoying a quiet sleep, while he describes the king as unable to rest. That is the poet true to nature ; and you will thus, by following observations of this kind, by applying that test to poetry as well as to history and to reasoning, obtain a correct judgment as to whether what you are reading is really worth your attention and worth your admiration, or whether it is faulty and is not so deserving. I may give another instance, and I could hardly venture to do so if my friend, Lord Carlisle, were here, because the want of truth I am going to point out is in the

writings of Pope. This is a very beautiful ode of Horace, in which, exalting the merits of poetry, he says that many brave men lived before Agamemnon ; that there were many great sieges before the siege of Troy ; that before Achilles and Hector existed, there were brave men and great battles ; but that, as they had no poet, they died, and that it required the genius of poetry to give immortal existence to the bravery of armies and of chiefs. Pope has copied this ode of Horace, and in some respects has well copied and imitated it in some lines which certainly are worthy of admiration, beginning :—

“ Lest you should think that verse shall die,
Which sounds the silver Thames along.”

But in the instances which he gives he mentions Newton, and says that not only brave men had lived and fought, but that other Newtons “ systems fram’d.” Now, here he has not kept to the merit and truth of his original, for, though it may be quite true that there were distinguished armies and wonderful sieges, and that their memory has passed into oblivion, it is not at all probable that any man like Newton followed by mathematical roads the line of discovery, and that those great truths which he discovered should have perished and fallen into oblivion. I give you these two instances of want of truth even in celebrated poets, and I think it is a matter you will do well to keep in view, because there is a remarkable difference between the history of science and the history of literature. In the history of science the progress of discovery is gradual. Those who make these discoveries sometimes commit great errors. They fall into many absurd mistakes, of which I could give you numerous instances ; but these blunders and these errors disappear—the discoveries alone remain ; other men afterwards make these discoveries the elements and groundwork of new investigations, and thus the progress of science is continual ; but truth remains, the methods of investigations even are shortened, and the progress continually goes on. But it is not so with regard to literature. It has, indeed, happened often in the history of the world, among nations that have excelled in literature, after great works had been produced which brought down the admiration of all who could read them, that others, attempting to go further,—attempting to do something still better,—have produced works written in the most affected and unnatural style, and, instead of promoting literature, have corrupted the taste of the nation in which they lived. Now, this is a thing against which I think we should always be upon our guard, and, having those great models of literature which we possess before us,—having Shakespeare, and Milton, and Pope, and a long line of illustrious

poets and authors,—we should always study to see that the literature of the day is, if not on a par with, at least as pure in point of taste as that which has gone before it, and to take care that we do not, instead of advancing in letters, fall back and decay in the productions of the time. I will now mention to you another instance. It is apparently but a trifling one, but still it is one in which I think nature and truth are so well observed that it may be worth your while to listen to it. One of our writers, who the most blended amusement with instruction, and ease of style with solidity of matter, as you all know, was Addison. He describes a ride he had along with a country squire, whom he fell in with in travelling from London to a distant town. They came to an inn, and Addison says that they ordered a bowl of punch for their entertainment. The country squire began, as was, perhaps, a mode with country squires, which may have continued even to the present day, to deprecate trade, and to say that foreign trade was the ruin of the country, and that it was too bad that the foreigner should have so much advantage of our English money. "Upon which," says Addison, "I just called his attention to the punch that we were going to drink, and I said: 'If it were not for our foreign trade, where would be the rum, and the lemons, and the sugar, which we are about to consume?'" The squire was considerably embarrassed by this remark, but the landlord, who was standing by, came to his assistance, and said: "There is no better drink than a cup of English water, if it has but plenty of malt in it." Now, although that appears a slight and trifling story, and told in a very common way, yet it is perfectly true to nature, and it conveys in a lively manner a rebuke to the ignorance and prejudice of the person with whom Addison represents himself to be conversing.

Having made these observations, you will, perhaps, permit me, ladies and gentlemen, to say that the cause of my venturing to come here *is, that I might both see the progress that you are making in instructions of all kinds, and also that I might express my hopes and my wishes for your welfare in the time that is to come.* It has been my fortune, since the active part of my life began, to live in times of peace and to see great discoveries and great improvements. I think you will feel that we who have had the direction of affairs during that time—I speak not now of any differences of political parties or of religious sects, but taking us altogether, all political parties, and men of all religious denominations,—I think that we have not done ill for the country during that period in which we have borne an active share in its affairs. If you look back to 1815, when a bloody and costly struggle terminated, I think you will see that since that period, whether by judgment of Parliament—whether by the action of great bodies and societies—or whether by the

skill and invention of individuals, the condition of the people of this land has very much improved. While the means of sustenance have become cheaper,—while the public burdens have become less,—while the means of education have been improved,—there has been, with these circumstances, and partly owing to these circumstances, a general progress in society. I think that we who have belonged to that time,—and, as I tell you again, I wish to make no political allusion, or to claim for one party over another any advantage,—but I say generally that we who have lived in this time have, upon the whole, not ill performed our duty. It will be for you, when we retire from the more active business of this scene, to endeavour to carry on to a still greater knowledge, to still more comfort, to still greater well-being, the country in which you live. There is a great charge imposed upon you, and I trust you will properly perform it. Let no insane passion carry you without reason into contests with foreign countries. Let no unworthy prejudices induce you to withhold from any part of your countrymen that which is their due. Let no previous convictions prevent you from examining every subject with impartial eyes, and from placing before you the light of truth, which ought to guide you in your investigations. With these convictions I am persuaded you will abide by the institutions which you have, by the faith which you hold, and that you will adorn the country to which you belong.

SIR ERNEST RUTHERFORD, F.R.S., O.M.

(1871-).

ERNEST RUTHERFORD was born in Nelson, New Zealand, August 30th, 1871. On his way to the highest honours of science, he passed through New Zealand University, the University of Cambridge, England, and laboratory studies which fitted him for demonstrating that such great discoveries as the Rontgen rays, radium and "radio-activity" do not mean revolution, but progress. He has given New Zealand standing at the front in science, but he belongs to "Greater Britain." As the Langworthy Professor and Director of Physics in the University of Manchester, England claimed him in 1907, after Canada had held him for ten years as Macdonald Professor of Physics in M'Gill University, Montreal. The Nobel prize for chemistry was awarded him in 1908 and he has a long list of other scientific honours which do not raise him as high in the estimation of the "scientific world" as his work in showing what energy means in matter and how universal energies can be used in life. In 1924 he received the Franklin Medal and Certificate of the Franklin Society of Philadelphia in recognition of his discovery of radio-activity.

ELECTRONS AND ATOMIC EXPLOSIONS

(An Address before the British Association for the Advancement of Science, at its Meeting in Winnipeg, Canada, 1909).

THERE has been a tendency in some quarters to suppose that the development of physics in recent years has cast doubt on the validity of the atomic theory of matter. This view is quite erroneous, for it will be clear from the evidence already discussed that the recent discoveries have not only greatly strengthened the evidence in support of the theory, but have given an almost direct and convincing proof of its correctness. The chemical atom as a definite unit in the subdivision of matter is now fixed in an impregnable position in science. Leaving out of account considerations of etymology, the atom in chemistry has long been considered to refer only to the smallest unit of matter that enters into ordinary chemistry combination. There is no assumption made that the atom itself is indestructible and eternal, or that methods may not ultimately be found for its subdivision into still more elementary units. The advent of the electron has shown that the atom is not the

unit of smallest mass of which we have cognizance, while the study of radio-active bodies has shown that the atoms of a few elements of high atomic weight are not permanently stable, but break up spontaneously with the appearance of new types of matter. These advances in knowledge do not in any way invalidate the position of the chemical atom, but rather indicate its great importance as a subdivision of matter whose properties should be exhaustively studied.

The proof of the existence of corpuscles or electrons with an apparent mass very small compared with that of the hydrogen atom, marks an important stage in the extension of our ideas of atomic constitution. This discovery, which has exercised a profound influence on the development of modern physics, we owe mainly to the genius of the president of this association. The existence of the electron as a distinct entity is established by similar methods and with almost the same certainty as the existence of individual particles. While it has not yet been found possible to detect a single electron by its electrical or optical effect, and thus to count the number directly as in the case of the α particles, there seems to be no reason why this should not be accomplished by the electric method. . . .

The general experimental evidence indicates that electrons play two distinct rôles in the structure of the atom, one as lightly attached and easily removable satellites or outliers of the atomic system, and the other as integral constituents of the interior structure of the atom. The former, which can be easily detached or set in vibration, probably play an important part in the combination of atoms to form molecules, and in the spectra of the elements; the latter, which are held in place by much stronger forces, can only be released as a result of an atomic explosion involving the disintegration of the atom. For example, the release of an electron with slow velocity by ordinary laboratory agencies does not appear to endanger the stability of the atom, but the expulsion of a high-speed electron from a radio-active substance accompanies transformation of the atom.

The transformation of the atom of a radio-active substance appears to result from an atomic explosion of great intensity in which a part of the atom is expelled with great speed. In the majority of cases, an α particle or atom of helium is ejected, in some cases a high-speed electron, while a few substances are transformed without the appearance of a detectable radiation. The fact that the α particles from a simple substance are all ejected with an identical and very high velocity suggests the probability that the charged helium atom before its expulsion is in rapid orbital movement in the atom. There is at present no definite evidence of the causes operative in these atomic transformations.

SIR EDWARD ALBERT SHARPEY SCHAFER

(1850-).

EDWARD ALBERT SHARPEY SCHAFER was born in London in 1850. He is Doctor of Science of three great Universities—Cambridge, Dublin and Melbourne. Besides being a Doctor of Science, Sir Edward Schafer is an M.D. of the Universities of Berne and Groningen, and F.R.S.

In 1874 Edward Schafer became Professor of Physiology in University College. He remained in this capacity for nine years. The sixteen years following 1883 were spent as "Jodrell" Professor. Professor Schafer also served loyally as Secretary of the British Association during the last five years of the nineteenth century. In 1912 he was elected President of the British Association.

For his distinguished educational services, as well as his fruitful research work in Science, Schafer was made a Knight before the outbreak of the Great War. He has been Professor of his favourite subject, Physiology, at the Edinburgh University since 1899.

THE HUMAN POST OFFICE

(Delivered in Edinburgh).

IT is the development of the nervous system, although not proceeding in all classes along exactly the same lines, which is the most prominent feature of evolution. By and through it all impressions reaching the organism from the outside are translated into contraction or some other form of cell activity. Its formation has been the means of causing the complete divergence of the world of animals from the world of plants, none of which possess any trace of a nervous system. Plants react, it is true, to external impressions, and these impressions produce profound changes and even comparatively rapid and energetic movements in parts distant from the point of application of the stimulus—as in the well-known instance of the sensitive plant. But the impressions are in all cases propagated directly from cell to cell—not through the

agency of nerve-fibres ; and in the absence of anything corresponding to a nervous system it is not possible to suppose that any plant can ever acquire the least glimmer of intelligence. In animals, on the other hand, from a slight original modification of certain cells has directly proceeded in the course of evolution the elaborate structure of the nervous system with all its varied and complex functions, which reach their culmination in the workings of the human intellect. 'What a piece of work is a man ! How noble in reason ! How infinite in faculty ! In form and moving how express and admirable ! In action how like an angel ! In apprehension how like a god !' But lest he be elated with his psychical achievements, let him remember that they are but the result of the acquisition by a few cells in a remote ancestor of a slightly greater tendency to react to an external stimulus, so that these cells were brought into closer touch with the outer world ; while on the other hand, by extending beyond the circumscribed area to which their neighbours remained restricted, they gradually acquired a dominating influence over the rest. These dominating cells become nerve-cells ; and now not only furnish the means for transmission of impressions from one part of the organism to another, but in the progress of time have become the seat of perception and conscious sensation, of the formation and association of ideas, of memory, volition, and all the manifestations of the mind !

The most conspicuous part played by the nervous system in the phenomena of life is that which produces and regulates the general movements of the body—movements brought about by the so-called voluntary muscles. These movements are actually the result of impressions imparted to sensory or afferent nerves at the periphery—e.g., in the skin or in the several organs of special sense ; the effect of these impressions may not be immediate, but can be stored for an indefinite time in certain cells of the nervous system. The regulation of movements—whether they occur instantly after reception of the peripheral impression or result after a certain lapse of time ; whether they are accompanied by conscious sensation or are of a purely reflex and unconscious character—is an intricate process, and the conditions of their co-ordination are of a complex nature involving not merely the causation of contraction of certain muscles, but also the prevention of contraction of others. For our present knowledge of these conditions we are largely indebted to the researches of Professor Sherrington.

A less conspicuous but no less important part played by the nervous system is that by which the contractions of involuntary muscles are regulated. Under normal circumstances these are always independent of consciousness, but their regulation is brought about in much the same way as is that of the contractions of voluntary muscles—viz., as the

result of impressions received at the periphery. These are transmitted by afferent fibres to the central nervous system, and from the latter other impulses are sent down, mostly along the nerves of the sympathetic or autonomic system of nerves, which either stimulate or prevent contraction of the involuntary muscles. Many involuntary muscles have a natural tendency to continuous or rhythmic contraction which is quite independent of the central nervous system ; in this case the effect of impulses received from the latter is merely to increase or diminish the amount of such contraction. An example of this double effect is observed in connection with the heart, which—although it can contract regularly and rhythmically when cut off from the nervous system and even if removed from the body—is normally stimulated to increased activity by impulses coming from the central nervous system through the sympathetic, or to diminished activity by others coming through the vagus. It is due to the readiness by which the action of the heart is influenced in these opposite ways by the spread of impulses generated during the nerve-storms which we term 'emotions' that in the language of poetry, and even of every day, the word 'heart' has become synonymous with the emotions themselves.

The involuntary muscle of the arteries has its action similarly balanced. When its contraction is increased, the size of the vessels is lessened and they deliver less blood ; the parts they supply accordingly become pale in colour. On the other hand, when the contraction is diminished the vessels enlarge and deliver more blood ; the parts which they supply become correspondingly ruddy. These changes in the arteries, like the effects upon the heart, may also be produced under the influence of emotions. Thus 'blushing' is a purely physiological phenomenon due to diminished action of the muscular tissue of the arteries, whilst the pallor produced by fright is caused by an increased contraction of that tissue. Apart, however, from these conspicuous effects, there is constantly proceeding a less apparent but not less important balancing action between the two sets of nerve-fibres distributed to heart and blood-vessels ; which are influenced in one direction or another by every sensation which we experience and even by impressions of which we may be wholly unconscious, such as those which occur during sleep or anæsthesia, or which affect our otherwise insensitive internal organs.

A further instance of nerve-regulation is seen in secreting glands. Not all glands are thus regulated, at least not directly ; but in those which are, the effects are striking. Their regulation is of the same general nature as that exercised upon involuntary muscle, but it influences the chemical activities of the gland-cells and the outpouring of secretion

from them. By means of this regulation a secretion can be produced or arrested, increased or diminished. As with muscle, a suitable balance is in this way maintained, and the activity of the glands is adapted to the requirements of the organism. Most of the digestive glands are thus influenced, as are the skin-glands which secrete sweat. And by the action of the nervous system upon the skin-glands, together with its effect in increasing or diminishing the blood-supply to the cutaneous blood-vessels, the temperature of our blood is regulated and is kept at the point best suited for maintenance of the life and activity of the tissues.

The action of the nervous system upon the secretion of glands is strikingly exemplified, as in the case of its action upon the heart and blood-vessels by the effects of the emotions. Thus an emotion of one kind—such as the anticipation of food—will cause saliva to flow—‘the mouth to water’; whereas an emotion of another kind—such as fear or anxiety—will stop the secretion, causing the ‘tongue to cleave unto the roof of the mouth,’ and rendering speech difficult or impossible. Such arrest of the salivary secretion also makes the swallowing of dry food difficult: advantage of this fact is taken in the ‘ordeal by rice’ which used to be employed in the East for the detection of criminals.

The activities of the cells constituting our bodies are controlled, as already mentioned, in another way than through the nervous system, viz., by chemical agents (hormones) circulating in the blood. Many of these are produced by special glandular organs, known as internally secreting glands. The ordinary secreting glands pour their secretions on the exterior of the body or on a surface communicating with the exterior; the internally secreting glands pass the materials which they produce directly into the blood. In this fluid the hormones are carried to distant organs. Their influence upon an organ may be essential to the proper performance of its functions or may be merely ancillary to it. In the former case removal of the internally secreting gland which produces the hormone, or its destruction by disease, may prove fatal to the organism. This is the case with the suprarenal capsules: small glands which are adjacent to the kidneys, although having no physiological connection with these organs. A Guy’s physician, Dr. Addison, in the middle of the last century showed that a certain affection, almost always fatal, since known by his name, is associated with disease of the suprarenal capsules. A short time after this observation a French physiologist, Brown-Séquard, found that animals from which the suprarenal capsules are removed rarely survive the operation for more than a few days. In the concluding decade of the last century interest in these bodies was revived by the

discovery that they are constantly yielding to the blood a chemical agent (or hormone) which stimulates the contractions of the heart and arteries and assists in the promotion of every action which is brought about through the sympathetic nervous system (Langley). In this manner the importance of their integrity has been explained, although we have still much to learn regarding their functions.

Another instance of an internally secreting gland which is essential to life, at least to its maintenance in a normal condition, is the thyroid. The association of imperfect development or disease of the thyroid with disorders of nutrition and inactivity of the nervous system is well ascertained. The form of idiocy known as cretinism and the affection termed myxœdema are both associated with deficiency of its secretion: somewhat similar conditions to these are produced by the surgical removal of the gland. The symptoms are alleviated or cured by the administration of its juice. On the other hand, enlargement of the thyroid, accompanied by increase of its secretion, produces symptoms of nervous excitation, and similar symptoms are caused by excessive administration of the glandular substance by the mouth. From these observations it is inferred that the juice contains hormones which help to regulate the nutrition of the body and serve to stimulate the nervous system, for the higher functions of which they appear to be essential. To quote M. Gley, to whose researches we owe much of our knowledge regarding the functions of this organ: '*La genèse et l'exercice des plus hautes facultés de l'homme sont conditionnés par l'action purement chimique d'un produit de sécrétion. Que les psychologues méditent ces faits!*'

The case of the parathyroid glandules is still more remarkable. These organs were discovered by Sandström in 1880. They are four minute bodies, each no larger than a pin's head, imbedded in the thyroid. Small as they are, their internal secretion possesses hormones which exert a powerful influence upon the nervous system. If they are completely removed, a complex of symptoms, technically known as 'tetany,' is liable to occur, which is always serious and may be fatal. Like the hormones of the thyroid itself, therefore, those of the parathyroids produce effects upon the nervous system, to which they are carried by the blood; although the effects are of a different kind.

Another internally secreting gland which has evoked considerable interest during the last few years is the pituitary body. This is a small structure no larger than a cob-nut attached to the base of the brain. It is mainly composed of glandular cells. Its removal has been found (by most observers) to be fatal—often within two or three days. Its hypertrophy, when occurring during the general growth of the body, is

attended by an undue development of the skeleton, so that the stature tends to assume gigantic proportions. When the hypertrophy occurs after growth is completed, the extremities—viz., the hands and feet, and the bones of the face—are mainly affected; hence the condition has been termed “acromegaly” (enlargement of extremities). The association of this condition with affections of the pituitary was pointed out in 1885 by a distinguished French physician, Dr. Pierre Marie. Both ‘giants’ and ‘acromegalists’ are almost invariably found to have an enlarged pituitary. The enlargement is generally confined to one part—the anterior lobe—and we conclude that this produces hormones which stimulate the growth of the body generally and of the skeleton in particular. The remainder of the pituitary is different in structure from the anterior lobe and has a different function. From it hormones can be extracted which, like those of the suprarenal capsule, although not exactly in the same manner, influence the contraction of the heart and arteries. Its extracts are also instrumental in promoting the secretion of certain glands. When injected into the blood they cause a free secretion of water from the kidneys and of milk from the mammary glands, neither of which organs are directly influenced (as most other glands are) through the nervous system. Doubtless under natural conditions these organs are stimulated to activity by hormones which are produced in the pituitary and which pass from this into the blood.

The internally secreting glands which have been mentioned (thyroid, parathyroid, suprarenal, pituitary) have, so far as is known, no other function than that of producing chemical substances of this character for the influencing of other organs, to which they are conveyed by the blood. It is interesting to observe that these glands are all of very small size, none being larger than a walnut, and some—the parathyroids—almost microscopic. In spite of this, they are essential to the proper maintenance of the life of the body, and the total removal of any of them by disease or operation is in most cases speedily fatal.

There are, however, organs in the body yielding internal secretions to the blood in the shape of hormones, but exercising at the same time other functions. A striking instance is furnished by the pancreas, the secretion of which is the most important of the digestive juices. This—the pancreatic juice—forms the external secretion of the gland, and is poured into the intestine, where its action upon the food as it passes out from the stomach has long been recognised. It was, however, discovered in 1889 by von Mering and Minkowski that the pancreas also furnishes an internal secretion, containing a hormone which is passed from the pancreas into the blood, by which it is carried first to the liver and afterwards to the body generally. This hormone is essential to the proper

utilisation of carbohydrates on the organism. It is well known that the carbohydrates of the food are converted into grape sugar and circulate in this form in the blood, which always contains a certain amount ; the blood conveys it to all the cells of the body, and they utilise it as fuel. If, owing to disease of the pancreas or as the result of its removal by surgical procedure, its internal secretion is not available, sugar is no longer properly utilised by the cells of the body and tends to accumulate in the blood ; from the blood the excess passes off by the kidneys, producing diabetes.

Another instance of an internal secretion furnished by an organ which is devoted to other functions is the 'pro-secretin' found in the cells lining the duodenum. When the acid gastric juice comes into contact with these cells it converts their pro-secretin into 'secretin.' This is a hormone which is passed into the blood and circulates with that fluid. It has a specific effect on the externally secreting cells of the pancreas, and causes the rapid outpouring of pancreatic juice into the intestine. This effect is similar to that of the hormones of the pituitary body upon the cells of the kidney and mammary gland. It was discovered by Bayliss and Starling.

The reproductive glands furnish in many respects the most interesting example of organs which—besides their ordinary products, the germ and sperm-cells (ova and spermatozoa)—form hormones which circulate in the blood and effect changes in cells of distant parts of the body. It is through these hormones that the secondary sexual characters, such as the comb and tail of the cock, the mane of the lion, the horns of the stag, the beard and enlarged larynx of a man, are produced, as well as the many differences in form and structure of the body which are characteristic of the sexes. The dependence of these so-called secondary sexual characters upon the state of development of the reproductive organs has been recognised from time immemorial, but has usually been ascribed to influences produced through the nervous system, and it is only in recent years that the changes have been shown to be brought about by the agency of internal secretions and hormones, passed from the reproductive glands into the circulating blood.

It has been possible in only one or two instances to prepare and isolate the hormones of the internal secretions in a sufficient condition of purity to subject them to analysis, but enough is known about them to indicate that they are organic bodies of a not very complex nature, far simpler than proteins and even than enzymes. Those which have been studied are all dialysable, are readily soluble in water but insoluble in alcohol, and are not destroyed by boiling. One at least—that of the

medulla of the suprarenal capsule—has been prepared synthetically, and when their exact chemical nature has been somewhat better elucidated it will probably not be difficult to obtain others in the same way.

From the above it is clear that not only is a co-ordination through the nervous system necessary in order that life shall be maintained in a normal condition, but a chemical co-ordination is no less essential. These may be independent of one another ; but on the other hand they may react upon one another. For it can be shown that the production of some at least of the hormones is under the influences of the nervous system whilst, as we have seen, some of the functions of the nervous system are dependent upon hormones.

FREDERICK SODDY, F.R.S.

(1877-).

FREDERICK SODDY was born at Eastbourne on the 2nd September, 1877. He was educated at Eastbourne College, University College of Wales, Aberystwyth, and Merton College, Oxford. In 1900 he accepted the post of Demonstrator in Chemistry, McGill University, Montreal. After serving for two years he received training in scientific investigation under Sir Ernest Rutherford and Sir William Ramsay. Professor Soddy afterwards shared in their discoveries.

In 1904 he was offered the important position of Lecturer in Physical Chemistry and Radio-Activity at the University of Glasgow. From here he went to Aberdeen University where he remained ten years as Lecturer of Chemistry. During this period he made great contribution to physical chemistry, and to the new theory of the constitution of matter and the liberation of energy by the breaking down of atoms.

In 1905 Professor Soddy became President of the Rontgen Society, and not long ago was awarded the Cannizzaro Prize by the Acc. d. Lincei, Rome. Amongst his publications figures his little book, "Matter and Energy," in the Home University Library which is quite a treasure. Again in his "Science and Life" there is to be found a wide and fresh human outlook. Among his more technical books may be noted "The Interpretation of Radium" and the "Chemistry of the Radio-element."

At the time of writing Professor Soddy occupies the chair of Inorganic and Physical Chemistry at the University of Oxford. The Professor received the honour of Fellowship of the Royal Society in 1910.

MATTER AND SPIRIT

(Delivered at Aberdeen, 1919).

THE feeling is gradually awakening in the consciousness of the community, that the discoveries and advances made by science in the past century are not such as they have been accustomed to be represented by people to whom they are a sealed book, as important to money-making and trade, for waging war and overtaking the

heavy drudgery of the world, but in an altogether different category from humane studies. The scientific materialist in seeking to understand the external physical universe, and the relation in which men stand thereto, has invaded territories which formerly the humanist and theologian had to themselves, and made discoveries which are essential to the understanding of modern life and its problems. If it were necessary to make choice between the old and the new in its relation to the world of to-day, rather than in relation to some remote childhood of the world, the knowledge gained in the last hundred years surely is the part of the whole of knowledge which could least be spared. It is just this part which men who have to govern modern peoples, administer the affairs of present-day empires, and instruct and educate the youth of the world, usually know least about. That science has something to say apart from its application to the material and utilitarian interests of men, that its revelation is both clear and inspiring, "a source not merely of material convenience but of spiritual elevation," as Mr. Arthur Balfour has said, is, however, now being more generally understood.

Science has wrecked beyond repair certain dogmas and beliefs generally current prior to the development of the doctrine of evolution on the biological side. That doctrine has completely reversed the traditional outlook of men and turned their highest interest from the contemplation of the past to the problems of the future. But physical science, the science, in the first instance, of the inanimate world, contemporaneously with these great developments of biology, has contributed in its doctrine of energy an advance of direct and living human interest certainly not less, and possibly even of greater fundamental importance than the conception of evolution. It, therefore, is almost a duty of the scientific man, however little he may desire or feel himself competent for the task, to attempt to rebuild as well as destroy, and to state, so far as he can, what is his view of the matters in which hitherto the priest and the philosopher have, with insufficient knowledge of external nature, been left to themselves. Such a synthesis has been hitherto attempted, if at all, from the standpoint of biological science, with which, I need scarcely say, I am totally unfitted to deal. In approaching it from the purely physical standpoint, one has a very great advantage that one starts from a basis which now may be considered beyond controversy or cavil, and which even the phenomena of life cannot complicate or make obscure. On the other hand, the corresponding disadvantage is that one starts farther off from and has a greater distance to go to reach the domain that has to be brought into reconciliation with external nature. The biologist dealing with life from the scientific standpoint has the more central position. The ultimate problems of matter and

energy, on the one hand, lie equally outside his true domain, and are apt to appear, perhaps, equally inaccessible and mysterious. The physicist from his more extreme standpoint, completely outside of the realm of life, may not be able to see very far, but what he can see is seen with all the certainty and definiteness that distinguish and characterise the explanation of the phenomena with which he deals. Do not draw the hasty conclusion that, because the clarity and unanimity reached in the study of inanimate nature have not been approached in the study of life, they have therefore no application whatever to the higher aspects of life. On the contrary, I hope to show that, as regards what it is impossible to believe at least, they effect a not inconsiderable simplification, and so pave the way at least for a more definite and truer human philosophy to replace the old.

Life, so far as our direct experience is concerned, is lived in an intimate relation with the external physical universe, and the breaking of that connection is death. Almost before men could count or reason correctly about the simplest phenomena, they have contended that life transcends the breaking of the bond between it and the external world and persists after it has departed from this world. The attitude of mind is very familiar in science, as in other fields. Amid a world of appearance and change, science seeks the fundamental and abiding realities, and the test it applies is the test of "conservation." Whatever is conserved unchanged during all possible changes is regarded as real. We speak of the conservation of matter, because though, to casual observation, matter is anything but conserved,—for example, fuel is "consumed" by fire, and the acorn grows into the oak,—yet the appearances are false, and the total amount of matter remains constant in these as in all other changes.

Nor is it necessary that what is conserved should be material and tangible. We speak of the conservation of energy, meaning that in the variegated interplay of matter, motion and force, whatever happens, however complicated the mechanism or however violent and catastrophic the events, something is unchanged and remains the same before and after, and that something is termed energy. It is a complex conception capable of being illustrated in simple cases by reference to actual phenomena, but to be accurately defined needs to be expressed as a mathematical relation between the matter, forces and motions involved. But nothing, not even money, has a more real existence.

In modern science, matter and energy are the unchangeable realities that can neither be created nor destroyed. If they appear they must come from somewhere, and if they disappear they must go somewhere. So whatever extraordinary events may occur, behind the changing

appearances there is a definite basis of unalterable reality in the physical world.

The doctrine of the immortality of the spirit or conservation of personality may be regarded as the inverse form of the scientific argument above. The real part of a man is not his bodily organism, which is continually wasting away and being as continually renewed, nor the physical energy at its command, which is derived entirely from the inanimate world, but is the personality resident in the body and in control of it. There is no other interpretation of the difference between a man alive one moment and dead the next, which, in spite of the great advances in the interpretation of the mechanism of life made by biology, altogether eludes apprehension in terms of the other fundamental conceptions to which our inquiries into ourselves and our environment have led.

In science we regard that which is indestructible as having real existence. In philosophy and religion that which has a real existence has been from time immemorial regarded as immortal, and it seems to be truly in accordance with the laws of thought, which in science has led to some of the grandest and most fruitful generalisations, to find the idea of personal immortality running like a thread through religious beliefs, even down to the most primitive. I make no pretence to using, in their correct technical philosophical meaning, such terms as consciousness, personality and spirit. All I am concerned, for my argument, to state is that in passing from the phenomena of the inanimate world to those of life in general we have to admit at least one fundamental conception which cannot be connected with the conceptions of the inanimate world, and which it now seems most unlikely ever will be.

I have already warned you that from physical premises it is not possible or easy to proceed very far, and I make no pretence of discussing whether the personality, conscience and soul of a man is or is not, without any entirely new fundamental conception, capable of being regarded as the further development of the simple consciousness, or awareness, of its existence as a separate creature, possessed by the lowly organism. I accept the, to my mind, complete break of continuity between the animate and inanimate worlds, as being all that is really demanded by our present knowledge. If I am told that unless I make another such break between man and the animals, I weaken the argument I have suggested in accounting for the origin of the belief in the immortality of the soul, by including therein all living creatures, however humble, it is only necessary to say that the general doctrine of evolution of man from the lower animals seems to point unmistakably in this direction.

It is a nice question whether it is easier for the religious man to connect his system of thought with that of science, or for a scientific man to

find the due relationship between his conclusions and the common current outlook upon ethical and spiritual, if not specifically theological, beliefs. I would have thought that just as it is easier for a coachman to learn to drive a motor-car than for a chauffeur to learn to handle horses, so it ought to be easier for those whose concern has always been with human personality rather than its mechanism to master the essential principles that have led to the mechanistic philosophy of science. But that is probably mere personal bias. The two studies belong to different worlds, as the poles apart, so far as they concern humanity, but men can afford to neglect neither. It is the priests, not religion, it is difficult for scientific men to live with, and science cannot co-exist with priest-craft. The scientific man seeks truth as a continually developing revelation, and he changes his outlook on the world according as it unfolds itself before his eyes. The priest teaches that in some period of the world God Himself revealed Truth once and for all time, and his profession is to guard it against all comers. I do not believe that the soul any more than the mind can stagnate. It must grow or decay. Christianity cannot be crystallised into a creed binding for all time and, least of all, into a creed dating back to the century that preceded the relapse of Europe into intellectual barbarism. The world changes and has changed in the last hundred years out of all recognition, not on account of anything contained in the Mosaic or Christian revelations, but on account of the new revelations of science. Though these have come about by a process the reverse of supernatural, by laborious experiment and measurement, by slow accumulation of knowledge and honest and unbiassed weighing of the evidence, they constitute an essential part of the whole truth, be our religious convictions what they may.

There is another important difference between what is understood by truth in the realms of science and religion respectively. A truth that claims to be a divine revelation must necessarily be supposed to be the absolute or ultimate truth, which, by common consent, is unattainable by any of the methods of human inquiry. What a scientific man conceives to be the truth is, in reality, something quite distinct. He is not concerned, and, indeed, it is hardly too much to say that he is not even greatly interested, in ultimate, absolute and unattainable truth. He frames a hypothesis and tests it in every possible way. So long as every known or to be discovered fact is in accord with them, it is all he seeks to know. If, in the external universe, every event and phenomenon occurs in the precise and often predicable way it would occur if the hypothesis were true, that hypothesis is regarded as the truth, until something occurs which proves it to be in error. There is sometimes loose talk—even among scientific men attempting to generalise concerning

other subjects than those in which they have won their position—that the scientific hypothesis of one age becomes the laughing stock of the next, but such talkers are often the laughing stock of their own age to those best qualified to form an opinion. As a matter of fact, there is a steady and increasingly rapid advance being made into the foundations of knowledge, which is impressive in no way more than in the continuous evidence it affords that these foundations have been well and truly laid.

The methods of science in winning knowledge are of course its own. No one desires to suppose that they are the only methods by which Truth is to be sought or found. But when it comes to the modes of imparting knowledge already won, to educating the growing citizen to a knowledge of himself and his environment, we find differences as great.

In matters of science we do not start a child upon fundamentals. We do not say that in all the varied happenings of the universe the sum of half the product of the mass into the square of velocity and of the product of the distance into the force remains constant. We do not start with the conception of energy and from it deduce mechanical, thermal, electrical and chemical phenomena. The conception of energy belongs to the generalised philosophy of physical science and is the end result of generations of scientific thinkers. But the priests, of sections at least of the Christian religion, get hold of the child and confront it with all the end products of the philosophy of the childhood of the world, God and the soul, heaven and hell, angels, spirits and the mysteries of the Trinity, almost before it can walk.

Philosophies, whether scientific or humane, are the end and not the beginning of wisdom. They are the epitomised expressions of the understanding of the age in which they originated, and, in themselves, or at any other age, they are as little intelligible as shorthand would be to one who has not learnt longhand. They are in no sense the stepping-stones from which a totally immature or uneducated mind can leap to the inheritance of the ages. It leaps rather into chaos and absurdity. Especially when there occurs, as did occur with the triumph of barbarism at the close of the fourth century, an almost total break of intellectual continuity between the age they served and that to which they survive, they are apt to convey meanings as remote from the original as the conception of energy is from that of the Deity.

W. D'ARCY WENTWORTH THOMPSON

(1860-).

HE was born in Edinburgh in 1860, and educated at the Academy and University there. Later he studied at Trinity College, Cambridge, becoming Doctor of Literature (Cantab) in 1912; formerly "Herbert Spencer" lecturer at Oxford University, is now professor of natural history at St. Andrews University, and a member of the Fishery Board for Scotland.

Professor D'Arcy Thompson is the author and editor of several scientific publications. Amongst them we may mention his "Glossary of Greek Birds," (1895), and an edition of Aristotle's "Historia Animalium," (1912), also an important series of Blue-Books on the "Investigations of the North Sea Fisheries."

THE GREATER PROBLEMS OF BIOLOGY

(An Address to Section D, British Association, 1911).

I LOVE to think of the logarithmic spiral that is engraven over the grave of that great anatomist, John Goodsir (as it was over that of the greatest of the Bernoullis), so graven because it interprets the form of every molluscan shell, of tusk and horn and claw, and many another organic form besides. I like to dwell upon those lines of mechanical stress and strain in a bone that gave it its strength where strength is required, that Hermann Meyer and J. Wolff described, and on which Roux has bestowed some of his most thoughtful work; or on the "stream-lines" in the bodily form of fish or bird, from which the naval architect and the aviator have learned so much. I admire that old paper of Peter Harting's in which he paved the way for investigation of the origin of spicules, and of all the questions of crystallisation or pseudo-crystallisation in presence of colloids, on which subject Lehmann has written his recent and beautiful book. I sympathise with the efforts of Henking, Rhumbler, Hartog, Gallardo, Leduc, and others to explain on physical lines the phenomena of nuclear division. And, as I have said to-day, I believe that the forces of surface tension, elasticity, and pressure are adequate to account for a great multitude of the simpler phenomena, and the permutations and combinations thereof, that are illustrated in organic form.

I should gladly and easily have spent all my time this morning in dealing with these questions alone. But I was loath to do so, lest I should seem to overrate their importance, and to appear to you as an advocate of a purely mechanical biology.

I believe all these phenomena to have been unduly neglected, and to call for more attention than they have received. But I know well that though we push such explanations to the uttermost, and learn much in so doing, they will not touch the hearts of the great problems that lie deeper than the physical plane. Over the ultimate organisation of the living organism, we shall be left wondering still.

To a man of letters and the world, like Addison, it came as a sort of revelation that Light and Colour were not objective things, but subjective, and that back of them lay only motion or vibration, some simple activity. And when he wrote his essay on these startling discoveries, he found for it, from Ovid, a motto well worth bearing in mind, *causa latet, vis est notissima*. We may with advantage recollect it when we seek and find the Force that produces a direct effect, but stand in utter perplexity before the manifold and transcendent meanings of the great word "cause."

The similarity between organic forms and those that physical agencies are fit to produce still leads some men, like Stephane Leduc, to doubt or to deny that there is any gulf between, and to hold that spontaneous generation or the artificial creation of the living is but a footstep away. Others, like Delage and many more, see in the contents of the cell only a complicated chemistry, and in variation only a change in the nature and arrangement of the chemical constituents; they either cling to a belief in "heredity," or (like Delage himself) replace it more or less completely by the effects of functional use and by chemical stimulation from without and from within. Yet others, like Felix Auerbach, still holding to a physical or quasi-physical theory of life, believe that in the living body the dissipation of energy is controlled by a guiding principle, as though by Clerk Maxwell's demons; that for the living the law of Entropy is thereby reversed; and that life itself is that which has been evolved to counteract and battle with the dissipation of energy. Berthold, who first demonstrated the obedience to physical laws in the fundamental phenomena of the dividing cell or segmenting egg, recognises, almost in the words of John Hunter, a quality in the living protoplasm, *sui generis*, whereby its maintenance, increase, and reproduction are achieved. Driesch, who began as a "mechanist," now, as we have seen, harks back straight to Aristotle, to a twin or triple doctrine of the soul. And Bergson, rising into heights of metaphysics where the biologist, qua biologist, cannot climb, tells us (like Duran) that life transcends teleology, that the conceptions of mechanism and finality

fail to satisfy, and that only "in the absolute do we live and move and have our being."

"We end but a little way from where we began."

With all the growth of knowledge, with all the help of all the sciences impinging on our own, it is yet manifest, I think, that the biologists of to-day are in no self-satisfied and exultant mood. The reasons and the reasoning that contented the past generation call for re-enquiry, and out of the old solutions new questions emerge; and the ultimate problems are as inscrutable as of old. That which, above all things, we would explain, baffles explanation; and that the living is a living organism tends to re-assert itself as the biologist's fundamental conception and fact. Nor will even this concept serve us and suffice us when we approach the problems of consciousness and intelligence, and the mystery of the reasoning soul; for these things are not for the biologist at all, but constitute the psychologist's scientific domain. In wonderment says Aristotle does philosophy begin, and more than once he rings the changes on that theme. Now, as in the beginning, wonderment and admiration are the portion of the biologist, as of all those who contemplate the heavens and the earth, the sea, and all that in them is.

And if wonderment springs, as again Aristotle tells us, from ignorance of the cause of things, it does not cease when we have traced and discovered the proximate causes, the physical causes, the efficient causes of our phenomena. For beyond and remote from physical causation lies the End, the Final Cause of the philosopher, the reason Why, in the which are hidden the problems of organic harmony and autonomy, and the mysteries of apparent purpose, adaptation, fitness, and design. Here, in the reign of teleology, the plain rationalism that guided us through the physical facts and causes begins to disappoint us, and intuition, which is of close kin to faith, begins to make herself heard.

And so it is that, as in wonderment does all philosophy begin, so in amazement does Plato tell us that all our philosophy comes to an end. Ever and anon, in the presence of *Magnalia Naturae*, we feel inclined to say with the poet:

These things are not of to-day nor of yesterday, but evermore,
and knoweth whence they came."

I wish I could find the noblest words of all that come into my mind, but only the language of another of the greatest of the Greeks:

"The ways of His thoughts are as paths in a wood thick with leaves and one seeth through them but a little way."

SIR JOSEPH JOHN THOMSON

(1856-).

THE eloquence of the modern scientific platform has been seldom represented more strikingly than in the presidential address delivered by Sir Joseph John Thomson before the British Association for the Advancement of Science at its meeting in Winnipeg, Canada, in 1909. As a definition of Twentieth Century advance in explaining the great universal forces of nature now being put to such striking uses in improving the world, it attracted world-wide attention. He was born near Manchester, England, December 18th, 1856. The Nobel prize for research in physics was awarded him in 1906 and he was knighted in 1908. His experimental researches and published writings make him one of the world's leaders in scientific thought. His distinctions include O.M. and F.R.S.

THE ATOMIC THEORY

IT was not until 1803, the date of Dalton's Atomic Theory, that the conception of the atom played any considerable part in scientific discovery. Dalton's theory was based on the proportions by weight of the different elements in various chemical compounds ; he showed that these proportions are exactly those which would exist if each element consisted of a great number of particles, all the particles of any one element being exactly alike, but each element having its own particular kind of particle.

For some time after Dalton's enunciation of his theory, no very important advances were made in our knowledge of atoms, but in the second half of the nineteenth century the Atomic Theory was greatly advanced by the work of Clausius, Clerk Maxwell, Boltzmann, Joule, Kelvin, and Willard Gibbs on the Kinetic Theory of Gases. These philosophers showed that many of the properties of gases can be explained if the gas is regarded as a collection of a very large number of small particles in rapid motion. Some important results as to the size of atoms were

obtained in this way, but the greater part of the researches of this time had to do with the properties of swarms of atoms, and threw but little light on the constitution of the individual atom.

In fact, it was not until quite the close of the nineteenth century, when attention was turned to the study of electrified atoms instead of unelectrified ones, that our acquaintance with the atom became at all intimate.

The advance made through the electrification of the atom has been most remarkable ; it is due to the fact that an unelectrified atom is so elusive that unless more than a million million are present we have no means sufficiently sensitive to detect them. Or, to put it in another way, unless we had a better test for a man than we have for an unelectrified molecule, we should be unable to find out that the earth was inhabited.

The electrified atom or molecule, on the other hand, is much more assertive, so much so that it has been found possible in some cases to detect the presence of a single electrified atom. A billion unelectrified atoms may escape our observation, whereas a dozen or so electrified ones are detected without difficulty.

One reason why electrified atoms and molecules are so much easier to study is that we can subject them to forces far more intense than any we can apply to unelectrified ones ; we can exert much more control over them, and force them into situations where their habits can be observed.

For example, if a mixture of different kinds of electrified atoms is moving along in one stream, then, when electric and magnetic forces are applied to the stream simultaneously, the different kinds of atoms are sorted out, and the original stream is divided up into a number of smaller streams separated from each other. The particles in any one of the smaller stream are all of the same kind.

Thus, if the original stream contained a mixture of hydrogen and oxygen atoms, it would, by the action of the electric and magnetic forces, be split up into two separate streams, one consisting exclusively of oxygen atoms, the other of hydrogen atoms. We shall call the streams into which the original stream is split up the electric spectrum of the atoms. By means of it we can analyse a stream of atoms, just as a beam of light is analysed by sending it through a spectroscope and observing the different rays into which it is divided.

By means of the electric spectrum we can prove in a very direct and striking way some of the fundamental truths of the Atomic Theory—that a gas contained only a few kinds of particles, that all the particles of one kind have exactly the same mass, and there are molecules as well as atoms in the majority of gases, that some gases, such as helium

and mercury vapour, where there is only one stream instead of two, have atoms but no molecules.

But when we analyse in this way a gas through which an electric discharge is passing, we find, along with the atoms and molecules, particles of an altogether different type. These particles are always charged with negative electricity, and their mass is an exceedingly small fraction, $\frac{1}{1836}$, of that of the smallest atom known, the atom of hydrogen. They are so small that their volume bears to that of the atom much the same proportion as that between a small pellet and a large room.

These particles are called electrons or corpuscles, and no matter what the nature of the gas may be, whether it is hydrogen, helium, or mercury vapour, the electrons or corpuscles remain unchanged in quality. In fact, there is only one kind of electron, and we can get it out of every kind of matter. The conclusion is irresistible that the electron or corpuscle is a constituent of every atom, and that we are able, by forces that we have even now at our command, to detach it from the atom.

Since the electron can be got from all the chemical elements, we may conclude that electrons are a constituent of all atoms. By ingenious devices we are even able to calculate the number of electrons in the atoms. The number is not very far from half the atomic weight; thus in the carbon atom there would be six electrons, in the oxygen atom eight, and so on, while in the lightest atom, hydrogen, there is probably only one. This is a most interesting result when we remember that there is room for 1700 of these corpuscles in an atom of hydrogen.

The constant difference between the number of electrons in the atom of one element and that in the atom of the element next in the series is strong evidence in favour of the view that the atoms of the consecutive elements differ from each other by the addition of a primordial atom, which apparently is the atom of helium.

It is probable that the electrons in an atom, if they exceed a certain number, are divided up into groups, into a series of spherical layers, like the coatings of an onion, separated from each other by finite distances, the number of such layers depending upon the number of electrons in the atom, and thus upon its atomic weight.

The electrons in the outside layer will be held in their places less firmly than those in the inner layers; they are more mobile, and will arrange themselves more easily under the forces exerted upon them by other atoms. On the outside belt, therefore, depend what we may call the social qualities of the atom in relation to other atoms; while the electrons in the strata nearer the centre of the atom, which are much more firmly held, have to do with the more intrinsic properties of the atom.

The several ways of investigating the structure of the atom all involve great labour, and any one who has used them must often have felt what a boon it would have been if we had an eye which would enable us to have a good look at an atom and have done with it. Now I cannot say that any such eye has been invented, but Mr. C. T. R. Wilson has made some approach to it by a beautiful method by which we can see, not indeed the individual atom itself, but still the path of such an atom, and in some cases what is going on in the atom.

The method is based on the principle that when charged atoms or electrons are produced in air sufficiently super-saturated with water vapour, the water condenses on them and nowhere else. Thus each atom or electron is surrounded by a little drop of water, and the regions where they are produced are mapped out by threads of little drops of water resembling seed pearls; these can be photographed and studied at leisure. Now an electrified atom or electron travelling through a gas when it strikes against the atoms knocks some of the electrons out of them, and thus leaves behind it a trail of electrified wrecks. Mr. Wilson deposits drops of water on these wrecks, and thus the path of the electrified atom or electron is marked by a trail of drops of water which can be seen and photographed. We can map out in this way the path of even one atom.

Though what we know about the atom is but a minute fraction of what there is to know, some very important conclusions about atoms have been established on what seems strong evidence in the course of the last few years (1914). We know, for example, that there are such things as atoms, that the atoms of an element are all of one kind, that atoms of different elements contain a common constituent—the corpuscle or electron, about which we know a good deal. We know, too, the number of electrons in an atom.

We have strong evidence that the electrons in the atom are divided into groups, and that some properties of the atom, those which we associate with the innermost group, are connected in a very simple way with the total number of electrons in the atom; that there are other properties, notably the chemical ones, which change in a rhythmical way with the atomic weight of the element, and which depend upon the electrons near the surface of the atom.

Lastly, we know that there are regions in the atom, probably the most interesting of all, about which we know little or nothing, whose investigation will provide intensely interesting work for many generations of physicists, who will most assuredly have no reason to be "mournful that no new wonder may betide."

RADIUM AND RADIO-ACTIVITY

(Address before the British Association).

A STRIKING discovery like that of the Rontgen rays acts much like the discovery of gold in a sparsely populated country ; it attracts workers who come in the first place for the gold, but who may find that the country has other products, other charms, perhaps even more valuable than the gold itself. The country in which the gold was discovered in the case of the Rontgen rays was the department of physics dealing with the discharge of electricity through gases, a subject which, almost from the beginning of electrical science, had attracted a few enthusiastic workers, who felt convinced that the key to unlock the secret of electricity was to be found in a vacuum tube. Rontgen, in 1895, showed that when electricity passed through such a tube, the tube emitted rays which could pass through bodies opaque to ordinary light ; which could, for example, pass through the flesh of the body and throw a shadow of the bones on a suitable screen. The fascination of this discovery attracted many workers to the subject of the discharge of electricity through gases, and led to great improvements in the instruments used in this type of research. It is not, however, to the power of probing dark places, important though this is, that the influence of Rontgen rays on the progress of science has mainly been due ; it is rather because these rays make gases, and, indeed, solids and liquids, through which they pass conductors of electricity. It is true that before the discovery of these rays other methods of making gases conductors were known, but none of these were so convenient for the purpose of accurate measurement.

The study of gases exposed to Rontgen rays has revealed in such gases the presence of particles charged with electricity ; some of these particles are charged with positive, others with negative electricity.

The properties of these particles have been investigated ; we know the charge they carry, the speed with which they move under an electric force, the rate at which the oppositely charged ones recombine, and these investigations have thrown a new light not only on electricity, but also on the structure of matter.

Radio-Activity was brought to light by the Rontgen rays. One of the many remarkable properties of these rays is to excite phosphorescence in certain substances, including the salts of uranium, when they fall upon them. Since Rontgen rays produce phosphorescence, it occurred to Becquerel to try whether phosphorescence would produce Rontgen rays. He took some uranium salts which had been made to

phosphoresce by exposure, not to Rontgen rays but to sunlight, tested them, and found that they gave out rays possessing properties similar to Rontgen rays. Further investigations showed, however, that to get these rays it was not necessary to make the uranium phosphoresce, that the salts were just as active if they had been kept in the dark. It thus appeared that the property was due to the metal and not to the phosphorescence, and that uranium and its compounds possessed the power of giving out rays which, like Rontgen rays, affect a photographic plate, make certain minerals phosphoresce, and make gases through which they pass conductors of electricity.

Niepece de Saint-Victor had observed some years before this discovery that paper soaked in a solution of uranium nitrate affected a photographic plate, but the observation excited little interest. The ground had not then been prepared, by the discovery of the Rontgen rays, for its reception, and it withered and was soon forgotten.

Shortly after Becquerel's discovery of uranium, Schmidt found that thorium possessed similar properties. Then Monsieur and Madame Curie, after a most difficult and laborious investigation, discovered two new substances, radium and polonium, possessing this property to an enormously greater extent than either thorium or uranium, and this was followed by the discovery of actinium by Debiere. Now the researches of Rutherford and others have led to the discovery of so many new radio-active substances that any attempt at christening seems to have been abandoned, and they are denoted, like policemen, by the letters of the alphabet.

Mr. Campbell has recently found that potassium, though far inferior in this respect to any of the substances I have named, emits an appreciable amount of radiation, the amount depending only on the quantity of potassium, and being the same whatever the source from which the potassium is obtained or whatever the elements with which it may be in combination.

The radiations emitted by these substances are of three types, known as α , β and γ rays. The α rays have been shown by Rutherford to be positively electrified atoms of helium, moving with speeds which reach up to about one-tenth of the velocity of light. The β rays are negatively electrified corpuscles, moving in some cases with very nearly the velocity of light itself, while the γ rays are unelectrified, and are analogous to the Rontgen rays.

The radio-activity of uranium was shown by Crookes to arise from something mixed with the uranium, and which differed sufficiently in properties from the uranium itself to enable it to be separated by chemical analysis. He took some uranium, and by chemical treatment

separated it into two portions, one of which was radio-active and the other not.

Next Becquerel found that if these two portions were kept for several months, the part which was not radio-active to begin with gained radio-activity, while the part which was radio-active to begin with had lost its radio-activity. These effects and many others receive a complete explanation by the theory of radio-active change which we owe to Rutherford and Soddy.

According to this theory, the radio-active elements are not permanent, but are gradually breaking up into elements of lower atomic weight ; uranium, for example, is slowly breaking up, one of the products being radium, while radium breaks up into a radio-active gas called radium emanation, the emanation into another radio-active substance, and so on, and that the radiations are a kind of swan's song emitted by the atoms when they pass from one form to another ; that, for example, it is when a radium atom breaks up and an atom of the emanation appears that the rays which constitute the radio-activity are produced.

Thus, on this view of the atoms the radio-active elements are not immortal ; they perish after a life whose average value ranges from thousands of millions of years in the case of uranium to a second or so in the case of the gaseous emanation from actinium.

When the atoms pass from one state to another they give out large stores of energy, thus their descendants do not inherit the whole of their wealth of stored-up energy, the estate becomes less and less wealthy with each generation ; we find, in fact, that the politician when he imposes death duties is but imitating a process which has been going on for ages in the case of these radio-active substances.

Many points of interest arise when we consider the rate at which the atoms of radio-active substances disappear. Rutherford has shown that whatever be the age of these atoms, the percentage of atoms which disappear in one second is always the same ; another way of putting it is that the expectation of life of the atom is independent of its age—that an atom of radium a thousand years old is just as likely to live for another thousand years as one just sprung into existence.

Now this would be the case if the death of the atom were due to something from outside which struck old and young indiscriminately ; in a battle, for example, the chance of being shot is the same for old and young ; so that we are inclined at first to look to something coming from outside as the cause why an atom of radium, for example, suddenly changes into an atom of the emanation. But here we are met with the difficulty that no changes in the external conditions that we have as yet been able to produce have had any effect on the life of the atom ; as

far as we know at present the life of a radium atom is the same at the temperature of a furnace as at that of liquid air—it is not altered by surrounding the radium by thick screens of lead or other dense materials to ward off radiation from outside, and, what to my mind is especially significant, it is the same when the radium is in the most concentrated form, when its atoms are exposed to the vigorous bombardment from the rays given off by the neighbouring atoms, as when it is in the most dilute solution, when the rays are absorbed by the water which separates one atom from another. This last result seems to me to make it somewhat improbable that we shall be able to split up the atoms of the non-radio-active elements by exposing them to the radiation from radium; if this radiation is unable to effect the unstable radio-active atoms, it is somewhat unlikely that it will be able to affect the much more stable non-radio-active elements.

The energy developed by radio-active substances is exceedingly large, one gramme of radium developing nearly as much energy as would be produced by burning a ton of coal. This energy is mainly in the α particles, the positively charged helium atoms which are emitted when the change in the atom takes place; if this energy were produced by electrical forces it would indicate that the helium atom had moved through a potential difference of about two million volts on its way out of the atom of radium. The source of this energy is a problem of the deepest interest; if it arises from the repulsion of similarly electrified systems exerting forces varying inversely as the square of the distance, then to get the requisite amount of energy the systems, if their charges were comparable with the charge on the α particle, could not when they start be further apart than the radius of a corpuscle, 10^{-13} cm. If we suppose that the particles do not acquire this energy at the explosion, but that before they are shot out of the radium atom they move in circles inside this atom with the speed with which they emerge, the forces required to prevent particles moving with this velocity from flying off at a tangent are so great that infinite charges of electricity could only produce them at distances comparable with the radius of a corpuscle.

The properties of radium have consequences of enormous importance to the geologist as well as to the physicist or chemist. In fact, the discovery of these properties has entirely altered the aspect of one of the most interesting geological problems, that of the age of the earth. Before the discovery of radium it was supposed that the supplies of heat furnished by chemical changes going on in the earth were quite insignificant, and that there was nothing to replace the heat which flows from the hot interior of the earth to the colder crust. Now when the earth first solidified it only possessed a certain amount of capital in the form of

heat, and if it is continually spending this capital and not gaining any fresh heat it is evident that the process cannot have been going on for more than a certain number of years, otherwise the earth would be colder than it is. Lord Kelvin in this way estimated the age of the earth to be less than 100 million years. Though the quantity of radium in the earth is an exceedingly small fraction of the mass of the earth, only amounting according to the determinations of Professors Strutt and Joly to about five grammes in a cube whose side is 100 miles, yet the amount of heat given out by this small quantity of radium is so great that it is more than enough to replace the heat which flows from the inside to the outside of the earth. This, as Rutherford has pointed out, entirely vitiates the previous method of determining the age of the earth. The fact is that the radium gives out so much heat that we do not quite know what to do with it, for if there was as much radium throughout the interior of the earth as there is in its crust, the temperature of the earth would increase much more rapidly than it does as we descend below the earth's surface. Professor Strutt has shown that if radium behave in the interior of the earth as it does at the surface, rocks similar to those in the earth's crust cannot extend to a depth of more than forty-five miles below the surface.

It is remarkable that Professor Milne from the study of earthquake phenomena had previously come to the conclusion that rocks similar to those at the earth's surface only descend a short distance below the surface ; he estimates this distance at about thirty miles, and concludes that at a depth greater than this the earth is fairly homogeneous.

Though the discovery of radio-activity has taken away one method of calculating the age of the earth, it has supplied another.

The gas helium is given out by radio-active bodies, and since, except in beryls, it is not found in minerals which do not contain radio-active elements, it is probable that all the helium in these minerals has come from these elements. In the case of a mineral containing uranium, the parent of radium in radio-active equilibrium, with radium and its products, helium will be produced at a definite rate. Helium, however, unlike the radio-active elements, is permanent and accumulates in the mineral ; hence if we measure the amount of helium in a sample of rock and the amount produced by the sample in one year we can find the length of time the helium has been accumulating, and hence the age of the rock. This method, which is due to Professor Strutt, may lead to determinations not merely of the average age of the crust of the earth but of the ages of particular rocks and the date at which the various strata were deposited ; he has, for example, shown in this way that a specimen of the mineral thorianite must be more than 240 million years old.

JOHN TYNDALL

(1820-1893).

THE addresses on scientific topics delivered by Professor Tyndall in England and America represent deep thoughts expressed in language always fit, often beautiful, and not infrequently sublime. Born in Ireland August 21st, 1820, he began life in the office of a firm of engineers, and was afterwards a teacher at Queenwood College, Hants—a position from which he went to the University of Marburg to continue his own studies (1848-51). In 1852 he was elected a Fellow of the Royal Society ; and having won thus early in his career a recognition which no one deserved better, he used his advantages for the ends of science and used them so well that the world will always remain his debtor. He studied the laws of heat, light, and electricity with such penetration that the greatest scientific teachers and inventors of the world became his pupils. He called himself a “materialist,” but to him matter was “the living garment of God,” manifesting the Divine Power through law as the Divine Will. Whatever may be thought of his theological and political opinions, there can be no question of the eloquence with which he presented them. He died December 4th, 1893.

DEMOCRACY AND HIGHER INTELLECT

(A Lecture on Light, delivered in New York in 1873).

WHEN the Pilgrim Fathers landed at Plymouth Rock, and when Penn made his treaty with the Indians, the new-comers had to build their houses, to chasten the earth into civilization, and to take care of their souls. In such a community, science, and its more abstract forms, was not to be thought of. And, at the present hour, when your hardy Western pioneers stand face to face with stubborn Nature, piercing the mountains and subduing the forest and the prairie, the pursuit of science, for its own sake, is not to be expected. The first need of man is food and shelter ; but a vast portion of this continent is already raised far beyond this need. The gentlemen of New York, Brooklyn, Boston, Philadelphia, Baltimore, and Washington, have already built their houses, and very beautiful they are ; they have also secured their dinners, to the excellence of which I can also bear testimony. They have, in fact,

reached that precise condition of well-being and independence when a culture, as high as humanity has yet reached, may be justly demanded at their hands. They have reached that maturity, as possessors of wealth and leisure, when the investigator of natural truth, for the truth's own sake, ought to find among them promoters and protectors.

Among the many grave problems before them they have this to solve, whether a Republic is able to foster the highest forms of genius. You are familiar with the writings of De Tocqueville, and must be aware of the intense sympathy which he felt for your institutions, and this sympathy is all the more valuable, from the philosophic candour with which he points out, not only your merits, but your defects and danger. Now, if I come here to speak of science in America in a critical and captious spirit, an invisible radiation from my words and manner will enable you to find me out, and will guide your treatment of me to-night. But, if I, in no unfriendly spirit—in a spirit, indeed, the reverse of unfriendly—venture to repeat before you what this great historian and analyst of democratic institutions said of America, I am persuaded that you will hear me out. He wrote some three and twenty years ago, and perhaps would not write the same to-day; but it will do nobody any harm to have his words repeated, and, if necessary, laid to heart. In a work published in 1850, he says: "It must be confessed that, among the civilized peoples of our age, there are few in which the highest sciences have made so little progress as in the United States." He declares his conviction that, had you been alone in the universe, you would speedily have discovered that you cannot long make progress in practical science without cultivating theoretic science at the same time. But, according to De Tocqueville, you are not thus alone. He refuses to separate America from its ancestral home; and it is here, he contends, that you collect the treasures of the intellect without taking the trouble to create them.

De Tocqueville evidently doubts the capacity of a democracy to foster genius as it was fostered in the ancient aristocracies. "The future," he says, "will prove whether the passion for profound knowledge, so rare and so fruitful, can be born and developed so readily in democratic societies as in aristocracies. As for me," he continues, "I can hardly believe it." He speaks of the unquiet feverishness of democratic communities, not in times of great excitement, for such times may give an extraordinary impetus to ideas, but in times of peace. "There is then," he says, "a small and uncomfortable agitation, a sort of incessant attrition of man against man, which troubles and distracts the mind without imparting to it either animation or elevation." It rests with you to prove whether these things are necessarily so—whether the highest

scientific genius cannot find in the midst of you a tranquil home. I should be loath to gainsay so keen an observer and so profound a political writer, but, since my arrival in this country, I have been unable to see anything in the constitution of society to prevent a student with the root of the matter in him from bestowing the most steadfast devotion on pure science. If great scientific results are not achieved in America, it is not to the small agitations of society that I should be disposed to ascribe the defect, but to the fact that the men among you who possess the endowments necessary for scientific inquiry are laden with duties of administration or tuition so heavy as to be utterly incompatible with the continuous and tranquil meditation which original investigation demands. It may well be asked whether Henry would have been transformed into an administrator, or whether Draper would have forsaken science to write history ; if the original investigator had been honoured as he ought to be in this land. I hardly think they would. Still I do not think this state of things likely to last. In America there is a willingness on the part of individuals to devote their fortunes, in the matter of education, to the service of the Commonwealth, which is without a parallel elsewhere ; and this willingness requires but wise direction to enable you effectually to wipe away the reproach of De Tocqueville.

Your most difficult problem will be not to build institutions, but to make men ; not to form the body, but to find the spiritual embers which shall kindle within that body a living soul. You have scientific genius among you ; not sown broadcast, believe me, but still scattered here and there. Take all unnecessary impediments out of its way. Drawn by your kindness I have come here to give these lectures, and, now that my visit to America has become almost a thing of the past, I look upon it as a memory without a stain. No lecturer was ever rewarded as I have been. From this vantage ground, however, let me remind you that the work of the lecturer is not the highest work ; that in science the lecturer is usually the distributor of intellectual wealth amassed by better men. It is not solely, or even chiefly, as lecturers, but as investigators, that your men of genius ought to be employed. Keep your sympathetic eye upon the originator of knowledge. Give him the reason necessary for his researches, not overloading him either with the duties of tuition or administration, not demanding from him so-called practical results—above all things, avoiding that question which ignorance so often addresses to genius ; “What is the use of your work ?” Let him make truth his object, however unpractical for the time being, that truth may appear. If you cast your bread thus upon the waters, then be assured it will return to you, though it may be after many days.

